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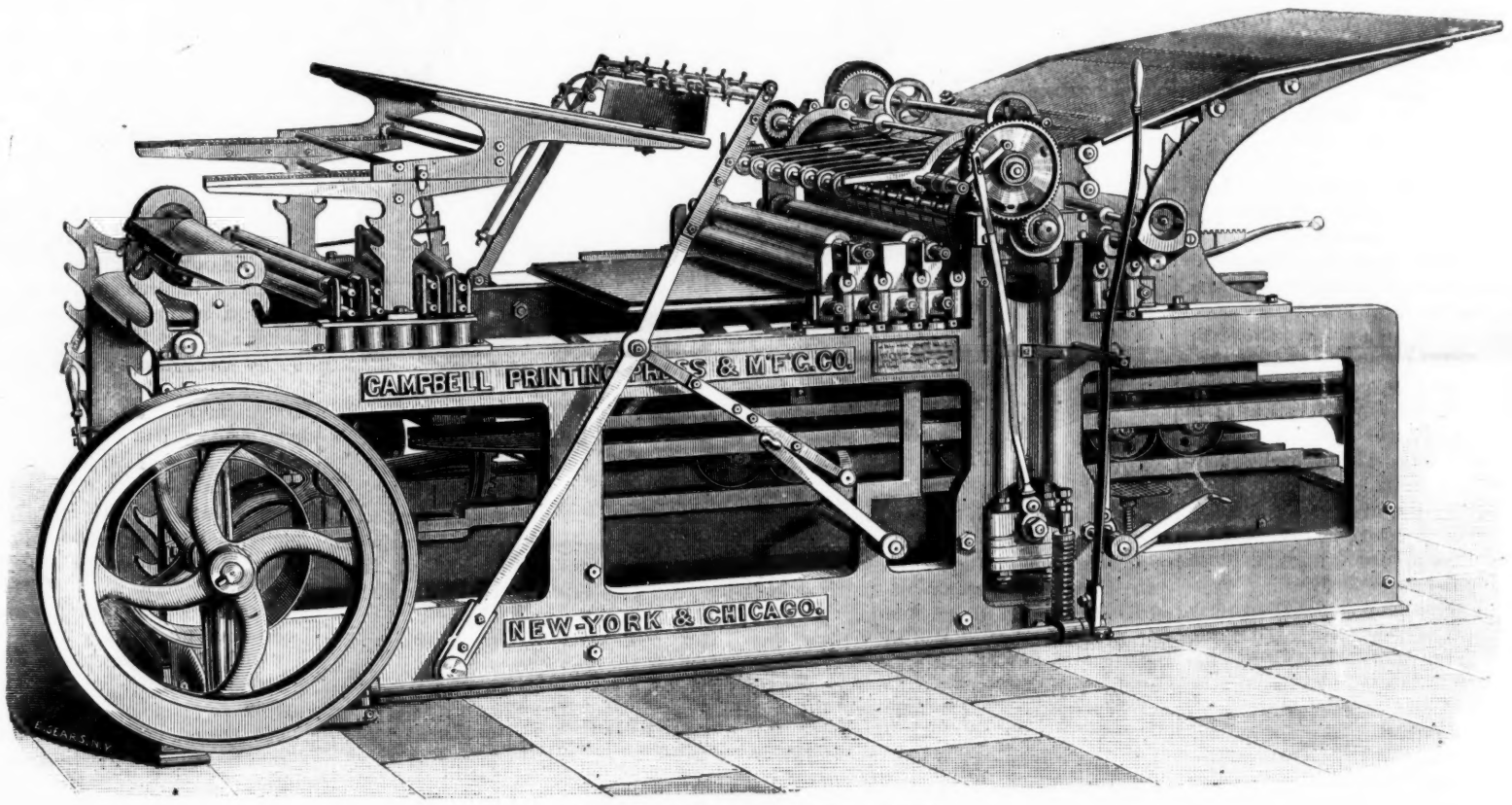
New Lithographic Printing Press.

The lithographic press illustrated on this page is one of a series of printing machines, the invention of, and recently patented by John T. Hawkins of the Campbell Printing Press and Manufacturing Co., Taunton, Mass.

The series includes also a single and a double cylinder typographic press and a web perfecting press, printing from the original flat type forms; all of them being adaptations of the oscillating cylinder type of machine.



NEW LITHOGRAPHIC PRINTING PRESS.

This lithographic machine is designed to accomplish several very important desiderata in lithographic printing, amongst which may be mentioned:

1st. The use of an impression cylinder of minimum diameter; obtaining the sharpest effects with the least total pressure upon the stone.

2d. The delivery of the sheet in a position placing the printed side in full view of the feeder, without allowing that side to come in contact with anything whatever in the process of delivery; and thus avoiding any possibility of smutting the work during delivery.

3d. Avoiding all complicated mechanism for rotating the cylinder continuously in one direction while the bed is reciprocated, as in the two revolution and other machines and all such articulating and disarticulating devices as are employed in the stop cylinder press (the usual form adopted for the lithographic machine) to permit of the cylinder resting during the retrograde motion of the bed, and gearing with the bed during the printing stroke, devices, all of which seriously limit the speed at which good work may be done, and which are perishable in a marked degree.

4th. Entire accessibility to the bed or stone both at the front and the back of the press, so that it may never be necessary to remove any roller in order to hand-roll, or perform any operation upon the stone at either extreme.

5th. The elevating plate of the bed, upon which the stone lies, has, in addition to the usual four adjusting and supporting screws, a supporting screw adjusted from the back of the machine supporting the stone at the center, rendering it much less liable to fracture, and permitting the use of thinner stones than when supported at the four corners only.

6th. The introduction of an auxiliary stone plate for use with thin stones, for the purpose of reinforcing the plate as the strength of the stone diminishes; stones may in this way be used down to one inch in thickness, or less in proportion to their other dimensions.

There are other novel features in it which will be recognized by the lithographer as desirable ones in the description following:

The machine is set very low, and may be fed from the floor by a man or woman of ordinary height, except possibly for the larger sizes; the rib or roller ways forming the base piece of the press. The bed and cylinder are simply geared together by rack and gear, the former being actuated by a crank and rolling gear, and the latter being rotated directly by the bed in both directions. The cylinder is so proportioned that it makes 1½ revolutions in each direction; its entire periphery being printing surface, except the gripper gap. The sheet is fed to guides, and at the moment of reversal of the cylinder's motion is carried by an automatic device in the same direction that the cylinder is moving, and at exactly the same rate, until the grippers close upon it; obviating the snatching of the sheet from a state of rest by the moving grippers, and insuring perfect register; the cylinder and all parts of the machine moving at that time at an extremely slow rate, due to the crank being upon, or near, its dead center. The grippers clasp the sheet upon the surface of lifter fingers, which latter rest upon the cylinder in such a manner as to preclude all possibility of corrugating the head of the sheet, and interfering with correct literal register.

The sheet is printed during the first revolution of the cylinder, and during its next half revolution is partially delivered from the top of the cylinder head, first upon a series of bridge or stripper fingers, a portion of it, if a full sheet, still enwrapping the cylinder. A series of oscillating grippers at this point close upon the leading edge of the sheet, the crank having reached its other dead center, and all parts of the machine having again come practically to a state of rest. Upon continuation of the crank's revolution, and the consequent reversal of the stroke of the bed, the sheet is drawn off the cylinder, in opposition to its retrograde motion, by the oscillating grippers; and during this retrograde or non-printing stroke it is automatically laid face up upon the receiving board, and in that position released by the oscillating grippers by the time that everything has again reached a minimum of motion from the crank again arriving at the dead center. With this construction, it will be seen that the simple and easy crank imparts motion to all parts of the mechanism, the motion being transmitted direct, insuring absolute uniformity of surface velocity between cylinder and bed, and performing all operations upon the sheet, aside from the actual printing, at the period of rest. These particular features admit of this machine being run at such speeds without noise or jar, and with perfectly accurate results, limited only by the capacity of the attendant to feed the sheets to the guides. The construction and operation of the guides are such as to give a much longer time within which the attendant may find the guides in place than is usually found, thus increasing the capacity of the feeder as well.

The feed board is hinged in the center, so that it may be thrown up from the cylinder, leaving it entirely clear for all operations upon it.

It will be seen that the receiving board, while being near to and inclined toward the feeder, so as to exhibit to his view the sheets as delivered, also leaves a clear space through which the stone may be readily seen, while it leaves the ink fountain and distributing angle rollers and ink plate unobstructed.

For rolling, leveling or other operations upon the stone—all of which can, however, be done with equal facility at the back of the press, where access may be had to it from three sides—the receiving board may be slid upon the T shaped ways toward the ink fountain, leaving everything clear.

It is provided with a trip, operated by the foot of the feeder, by means of which the cylinder may be kept off the stone for as many strokes of the bed as may be desired for rolling and re-rolling the stone. The ink and water rollers can also be raised from the stone by the two crank arms shown, both of which are accessible to the feeder from his place at the feed board.

Of course it is understood that in this machine the cylinder is automatically raised clear of the stone during the retrograde or non-printing stroke of the bed.

Combined with the belt shipper at the feeder's hand is a brake, by which, by the same motion as that which places the belt upon the loose pulley, the feeder may stop the machine within a half revolution of the cylinder.

This method of transmitting the crank

motion to all parts of the machine directly through the bed and cylinder, together with the small diameter of cylinder and its oscillating movement, and the method of delivering the sheet untouched upon its printed side, and printed side up in full view of the feeder, constitutes an entirely novel combination in a cylinder press, and relieves the printer and the lithographer particularly) of the main difficulties he has heretofore had to contend with.

A glance at the engraving will suffice to show the solid and substantial character of the general design of the machine, and the simplicity of the mechanism involving its principal movements insures durability.

The principal offices of the above named company are 45 Beekman street, New York, and 145 Monroe street, Chicago, Ill.

English Railroad Business.

At the recent annual session of the Institution of Engineers and Shipbuilders of Great Britain, Councilor Reid delivered the inaugural address, taking for his subject the increase of the railway system in connection with the shipping trade. Speaking of the development of railways in that country, he reviewed at some length the earlier enterprises, stating that at one time it cost 18s per ton to convey goods from Liverpool to Manchester at the average speed rate of about 1⅛ miles per hour. Since the introduction of the locomotive, great changes had taken place in the weight and power of the engines, Messrs. Nelson at the present time constructing engines with twelve wheels, and weighing altogether in working order upwards of 70 tons—a great change from Stephenson's first engine, which weighed about six tons. This was as great a proportionate increase in weight as the shipbuilders were now going in for in the length of the ships turned out by them, compared with the old steamers. During the year 1881, 623 millions of passengers traveled by rail in the United Kingdom, and of these 6 per cent. were first class. 10½ second class, and 85½ per cent third class.

Third-class passengers were increasing in number every year, and their accommodation was being improved by the leading companies, especially for long journeys. There were now 18,175 miles of railways in operation in that country, belonging to 410 companies--the two principal Scotch lines, the North British and the Caledonian, owning 1,831 miles. The total capital invested in them for the United Kingdom was £745,000,000. The earlier railways constructed on the "monumental" principle had been very costly, but by judicious and skillful engineering, and the adoption of gradients, the cost per mile of lines more recently formed had been much less. Some companies had of late attempted to manufacture their own plant and rolling stock, but the results showed that it was cheaper to get what they wanted from private firms.

Personal.

F. B. Allen, who is well known as special agent at New York branch office of the Hartford Boiler Insurance Co., has been promoted to the new position of "Supervising General Agent," office at Hartford, Conn. This office has been created by the necessities arising from the growth of the company's business, and the judgment of its managers in selecting Mr. Allen for the position will be commended by all who are acquainted with him.

Too Much Productive Industry.

The New York *Evening Post* concludes an article on "The State of Trade," by saying that "the general facts of a plethora of goods, a general decrease of enterprises, and a tendency toward less activity of capital are apparent."

The pumping engines at the Long Island City (N. Y.) Water Works have stopped for want of coal to run them, and the citizens are experiencing the results of official municipal extravagance.

New Combination Lathe Chuck.

We present with this, engravings representing a new combination chuck, manufactured by the E. Horton & Son Company, of Windsor Locks, Conn. In its general features this tool is much the same as the well known universal chuck, so long made by this company, its distinctive features being those which enable it to be readily changed to use either as a universal, independent, or eccentric chuck. As here shown, four jaws are employed, but it is furnished with three jaws when desired.

Referring to the engravings, Fig. 1 is a back view, Fig. 2 a front view, and Fig. 3 a view with the back part of the chuck removed, exposing the operating mechanism. From this it will be seen that at the back of the annular gear, its inner surface resting against it, is a loose ring. This ring, when the chuck is used as a universal chuck, holds

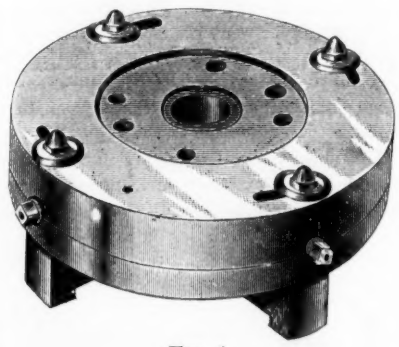


FIG. 1.

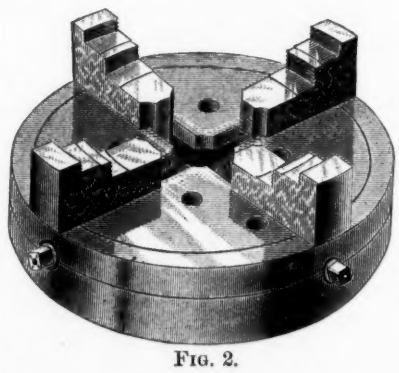


FIG. 2.

FIG. 3.

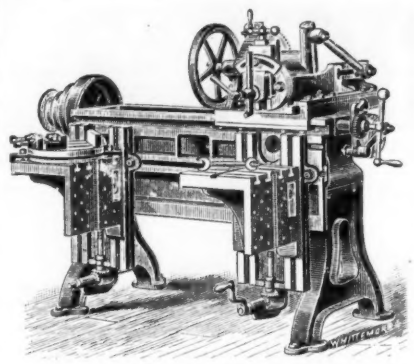
the gear in mesh with the pinions by means of steel shoes under each of the nuts, shown in this view and in Fig. 1. These steel shoes rest on the high portions of the ring, immediately behind the actuating pinions, and by presenting a bearing surface the entire width of the annular gear effectually prevent any tendency of the pinion and gear to spring, the one away from the other.

To adjust the jaws to be used independently, it is only necessary to move the steel shoes, which are attached to the nuts previously referred to by means of a guide post guided in the slot shown in Fig. 1. This movement brings the shoes opposite the pockets in the loose ring, shown in Fig. 3, which permits the gear to drop away from the pinions, when the chuck becomes independent.

In adjusting from independent to universal, the outer ends of the jaws are brought to a fine circular line on the face of the chuck, seen in Fig. 2. Then slide the shoes up the inclined plane (by means of the nuts) until they occupy the high surfaces of the ring.

The change from independent to universal is readily made, as in case the teeth of the gear and either pinion catch, one upon the other, it can at once be seen which pinion is out of the way, and the remedy applied.

The jaws of this chuck are made of Norway iron and case-hardened, and the pinions, screws, and small operating parts of cast steel.



Warren's Improved 12-Inch Stroke Shaping Machine.

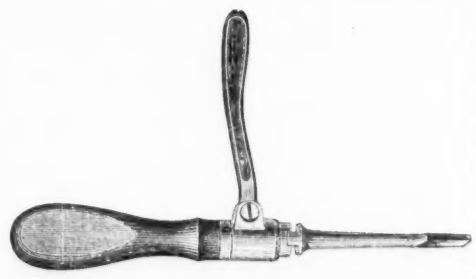
The engraving shown above represents an improved shaping machine, made by W. H. Warren, Worcester, Mass. The cutter-bar of this machine has a bearing 27 inches long and 8½ inches wide, with square gibs and convenient means of adjustment. It is driven by a variable quick-return motion. The connecting rod is of hammered iron, and is fitted with gun-metal thimbles and steel bushings.

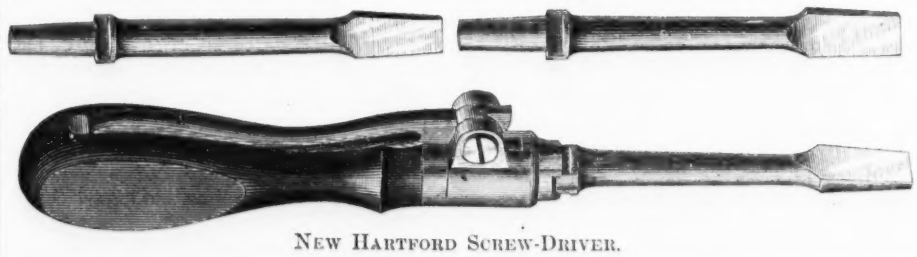
The driving is accomplished by means of the usual cone pulley, in addition to and independent of which there is a balance wheel running at a speed of 7 revolutions to one stroke of the cutter-bar. This wheel is located conveniently to be used for adjusting the tool to any desired line, and can, if desired, be used to operate the machine by hand, by the insertion of a handle.

The head, which is gibbed with square gibs, has a traverse of 33 inches.

The table is raised or lowered by a crank and bevel-gear attachment. By bringing the table against an opening in the bed, a long shaft can be inserted for slotting.

A rotary arbor with cones for circular work is furnished with the machine. This attachment is arranged to be very quickly attached or detached. A convenient chuck and a pair of centers are furnished, when desired.





NEW HARTFORD SCREW-DRIVER.

Work on the Hudson River Tunnel has stopped because, as it is stated, the company has spent all the money and cannot go ahead until more is forthcoming. The work thus far has cost about three quarters of a million dollars. The north tunnel has been driven from the New Jersey side 1542 feet from the shaft, and the south tunnel 570 feet. On the New York side the heading is only 74 feet out.

The New Hartford Screw-Driver.

To those who are accustomed to the use and abuse of slot-head screws in the construction of machinery, it is unnecessary to describe the instrument called a screw-driver, which, in many cases, is merely a square piece of steel flattened at each end, with one end driven into an old file-handle, and the other ground to a shape that would answer equally well for a cold-chisel. The same tool is used for three-eighths or half-inch screws, as the case may be, with a monkey-wrench to assist in tightening them up. The most careful workman, with such a screw-driver, will batter the slots and destroy a great many screws in the course of a year. Although by the use of improved machinery the cost of machine screws has been greatly reduced; in our larger shops, where there are from 600 to 800 men employed, if each man spoils a dozen screws in a year (one a month), at the small sum of from one to three cents apiece, it will amount to an item that would make most of our manufacturers "open their eyes."

The accompanying engraving illustrates an improved screw-driver, which is designed to meet the wants of machinists, gun-makers and metal workers in general. It has a steel lever riveted to a sleeve fitted loosely to, and covering a socket on which the ratchet teeth are cut.

The lever, when not in use, shuts into a recess in the wooden handle, where it is held in position by a spring, and when thus shut, the entire implement is only an ordinary screw-driver, neither the ratchet nor lever taking any part in its action. When used thus, it merely drives the screw until resistance becomes too great, when the lever is brought into action. For this purpose the lever is allowed to swing out of the handle, and as it assumes a horizontal position, its pivoted end, as a tooth, engages with the teeth of the ratchet inside the sleeve, thus becoming a lever corresponding in length to that of the arm, which is nearly that of the handle.

A very slight upward movement of the lever serves to disengage it from the ratchet, and it can then be carried around in either direction to engage with the next or any other tooth (ten in all) of the ratchet.

The blades, three in number, are drop-forged from tool steel, are interchangeable, and can be easily extracted from the socket by placing the flattened portion of one of the other blades between the end of the socket and the shoulder of the blade.

This screw driver, we are informed, has been thoroughly tested at the place of its manufacture, the Pratt & Whitney Company's Works, Hartford, Conn., and has been approved of by many of the leading mechanics of that city. Its proprietors are Rhodes & Hays, P. O. box 25, Hartford, Conn.

A short time since we noticed what appeared on good authority to be a fact, that the upper Mississippi was gradually becoming filled with sawdust to the detriment of navigation. We are glad to record, on the authority of *Wood and Iron*, that a joint committee of prominent business men and steamboatmen of St Paul and Minneapolis have been making an investigation of this matter and found no sawdust accumulating in the main channel, and think the accumulation in the eddies and shallows will prove an advantage, instead of, as was at one time feared, a serious impediment to navigation; that is by lodging on the wing-bars and shallows it serves the purpose of protecting them from the washing of the current, by which the sand was removed and deposited in the main channel.

Saunders Wheel Pipe-Cutter.

The small engraving herewith presented illustrates a new pipe cutter, recently put on the market by D. Saunders' Sons, Yonkers, N. Y., and which possesses some features of interest to those who use tools of this class. This tool is made in three sizes, to cut off gas pipe from ⅛" to 3" in diameter, or can be used with equal facility for cutting off boiler tubes, or tubing of any kind.

It will be seen by the engraving that the cutting is done by means of a rotary cutter. This cutter is journaled in a swinging block, or shoe, which is, as the cutting progresses, swung up to the work by means of the screw on the end of the lever. This block is in the form of a slotted shoe, embracing both sides of the stock, the surfaces of the latter being milled to standard size so as to insure a fit without shake as the cutter is swung either way to accommodate different diameters of pipe, and in the cutting off. The changes from one diameter of pipe to another can be very quickly made.

The pipe, in cutting, revolves against and with the two rollers shown. This not only reduces the friction to a minimum, but incidentally is an advantage for the following reason: In cutting off pipe the cutter ordinarily raises a burr, which must be removed before the pipe will enter the die for threading. By the use of these rollers, the raising of this burr is effectually prevented (by the rolling contact between the rollers and the pipe), thus leaving the outside of the latter smooth and in condition to be threaded without further preparation.

The rollers, also the pin or arbor of the cutter, are made of cast steel, hardened, thus insuring the best wearing qualities.

The parts are made as light as is consistent with the strength required, and there are no loose parts to become detached or mislaid.

SAUNDERS WHEEL PIPE-CUTTER.

A Reporter Interviews the Engineer of a Ferryboat.

A reporter of the Brooklyn *Eagle* lately called upon the engineer of a Fulton ferryboat while the latter was on duty. This is the way he describes what he saw and heard:

The old safety valve was set right, and he then led the writer down into the cellar of the boat, where they cook the steam that runs the engine. Instead of finding that the boat gradually narrowed to a point, the writer was astonished to see an elegantly fitted-up room, about one hundred and fifty feet long, with a floor as level as his head. In the center was an immense churn (which the engineer afterward explained was the engine) that was going round and round like some monster swinging Indian clubs. The whole place was lighted by knot-holes as big as pie plates, bored here and there along either side of the boat, and jets of gas lighted up the more secluded portions that the cabin granted.

Upon being questioned, Engineer Woolsey signified his willingness to answer all questions. It was ascertained that the law allows them to carry thirty pounds of steam, but that they seldom carry more than twenty. An ordinary ferryboat draws about six feet of water—that is, she will float in that depth. While partaking of a slight repast, consisting of beefsteak and onions, fresh milk and tea, the conversation proceeded. The table was spread near the steam gauge, and the thermometer stood at 102 degrees.

"Swish! swash! swish! swash!" went the water outside, and just as the writer had harpooned a particularly juicy section of steak an extraordinarily heavy "swish, swash!" was heard, and a wheelbarrowful of water came through the knot-holes (known in nautical circles as "deadeyes"), rescued the particularly juicy section from oblivion and swept it into safety.

"Oh, that's nothing," said the engineer, composedly: "that's the way we season our victuals."

Everything was as neat as a newly laid dollar down there. The floor was clean enough to eat off of, and the metal attachments to the machinery glistened in the sun and gaslight to a fairly dazzling glisten.

"Dong!" went the gong, and up jumped the engineer. He pulled on a handle, and the boat slackened its speed, and the Indian clubs began to move more slowly.

"Ding, dong!" went the gong, and the engineer pushed down again, the Indian clubs stopped, and the boat ceased its motion and then backed.

"Ding a ling," rang a little bell over head. Another pull on the handle and the monster began to practice with the clubs again, and the boat started on.

"Something ahead of us and we had to back down," explained the engineer.

"Is it always as hot as this down here?"

"No; I have seen it so cold that my clothes have been covered with ice. Then, again, the temperature has been up to 115 degrees."

"Is it absolutely safe? No fear of soaring?"

"Oh, no! There never was any danger. We have never had an explosion. We used to use two safety valves, but recently Chief Engineer Martin has put in what is known as the pop valve, as an additional safeguard. It gives us about thirty-five inches additional area to what we had before. We have now about sixty-four inches. We couldn't explode under any circumstances."

Thus assured, the conversation was resumed.

"Have another glass of milk. Put some ice in it."

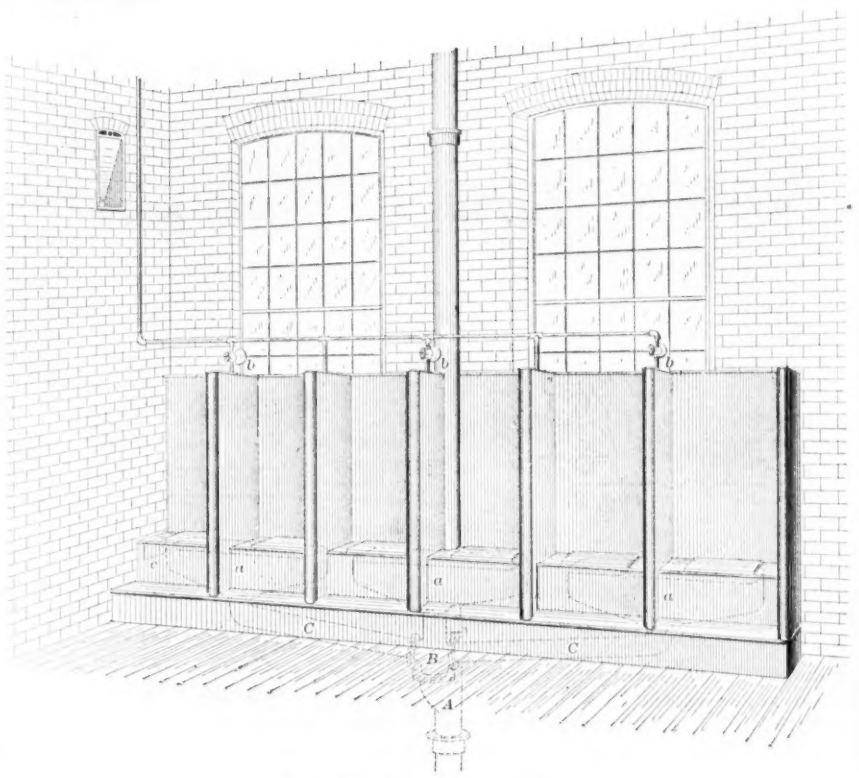
"Ice! Where do you put your ice?"

"We have an ice house over there in the corner."

Sure enough! over in one corner of the boat was a substantial structure for the keeping of the hard water.

"Hold on! The pilot wants me."

A conversation was held through the speaking tube, and after its conclusion the writer asked the engineer what the temperature was above. It was thirty-two, while below it was over a hundred, as the thermometer indicated, but it felt like two thousand, for the perspiration trickled down the writer's face, and filled his shoes.



SANITARY CLOSETS FOR SHOPS.

"Yes," resumed the engineer, in answer to a query, "I have been here since 1849—thirty-three years—but there are several who top me. I have felt no inconvenience from breathing this superheated atmosphere (he certainly didn't look as if he did, for he was fat and ruddy, and looked as if he was good for another thirty years of service), and I can't say that it has lessened my avoirdupois. We have plenty of room down here, as you can see. The boat below is about one hundred and seventy feet long, and the deadeyes give us plenty of pure air."

Sanitary Closets for Shops.

Comparatively little attention has been given to providing special means for the comfort and sanitary convenience of workmen in shops and factories. These matters are usually considered of second or third rate importance. Hardly a greater mistake could be made in shop management. Means for preserving health by suitably providing for every natural requirement are of the very highest importance to the workmen, and this fact should never be lost to the sight of proprietors of manufacturing establishments. Among the worst features about many machine shops are the closet arrangements.

The closets shown in the accompanying cut were designed by the Brown & Sharpe Manufacturing Company, and have been in use in their factory for the past ten years, giving entire satisfaction in convenience and freedom from odor. The cost for repairs of twenty-four closets during the ten years they have been in use has not exceeded twenty dollars. As arranged in their factory, there are six closets on each floor, a space of 15 feet long and 6 feet 6 inches wide only being needed for six closets and four urinals. They are connected under the seats with a ventilating flue in the chimney, and are emptied of their contents toward the close of the day by one of the laborers employed in sweeping and work of like character, and filled with clean water for the next day. In construction, they consist of a latrine, *a*, one of which answers for two closets, which are filled to within a few inches of the top with water, an overflow in the valve in the center of each preventing the filling too full. The water is let into the latrines through a pipe extending around the inside of the same, and which has perforations on the underside, the direction of the water in entering being such as to wash down the sides.

The valves alluded to are not shown in the cut, but they set upon seats in the center of the latrines immediately over the pipes *B* and *C*, to which the latrines are bolted and through which the contents enter the soil-pipe. Each valve has upon its face a rubber ring, which makes a water-tight joint by its own weight and that of the ball upon the top of a rod extending from the valve perpendicularly through the wood partition between the closets. A chain from the top of this rod, extending over a sheave in the ceiling, is used to raise the valve. These closets have been fitted up for several other factories, both large and small.

The New York Central Railroad Company has fitted up a school-car, for the instruction of trainmen in the use of the automatic brake. This car will be run on the different sections of the road, and the trainmen will be taught by competent instructors the proper use of the brake, under any emergencies likely to arise. This seems a very sensible move, and one that can hardly fail of yielding good results.

A New Invention Wanted.

We have devoted considerable space during the past two years to foundry matters, having endeavored to publish such things pertaining to foundry practice as were new, and of general interest to our readers. We are in receipt of a letter from an occasional and valued correspondent on matters of this kind, which leads to the belief that there is one point that has not been covered by any writers on this subject, and which may suggest to such of our readers as are of an inventive turn of mind, the possibility of "millions." We quote from the letter referred to: "* * * I had occasion, recently, to put a new man at melting, and selected a 'Colored Brother,' green at the business. I stood over him for two or three days, and finding that he could read, I loaned him a book on iron founding, thinking that by so doing he might instruct himself, which would be a good thing for him, and by saving my time, a good thing for me too. He promised to commit the contents of the book to memory. This morning he came to me and says: 'Boss, I'se been readin' and studyin' that book, and I remember a considerable heap of what you tol' me, but there aint nothing in that book, and you han't tol' me nothing to prevent the brick fallin' on my head. If I am gwine to work at this business any longer, I want an inwention that will stop that in the future.' Upon examination I found quite a serious cut on his head, but I havn't succeeded in hitting upon the 'inwention' that will keep a loose brick, when detached, from falling on his head if it is in the way."

There is now strong hope that the great Brooklyn Bridge will be completed within a year. The work is actually progressing so as to be noticeable by people who cross and recross the ferries every day. At the November monthly meeting of the trustees the financial report showed:

Total receipts to date..	$14,072.7 8 16
Total expenditures....	14,045,683 86
Cash on hand.....	27,019 30
Liabilities.....	127,269 26

The steel required for its completion has all been furnished by the contractors, as well as the lumber for the flooring. Arrangements have been made for two motors (costing $4,600 each), to shift cars on the roadway, also for some changes in the contract for stationary engines, by which the trains that are to cross the bridge are to be moved. The trustees also directed a contract to be made for ornamental railing for the promenade around the bridge terminus. An investigating committee has been authorized to inquire into the expenditure of the fourteen million dollars that have been swallowed up during the progress of the bridge, since the first work was done upon it. As the great structure approaches completion, interest is likely to grow cold in the work of the investigating committee, yet if the bridge does not show progress from week to week the people will demand some activity on the part of that committee. The managers will therefore be kept active, and in a few months the bridge will probably be in use.

Laying Brick by Electric Light.

The electric light was put to a new use in Albany last night. A builder, anxious to hurry work on a structure in that city, had his workmen lay brick under the illumination, and the men continued work until 11 o'clock. The light will be used until the rush is over. A large crowd watched the novel sight of bricklaying by electric light. —*Troy Evening Standard.*

Dr. John B. Wood, the well-known journalist, has resigned his position on the New York *Herald* to take editorial charge of the St. Louis *Evening Chronicle*. He has had thirty-two years' experience in journalistic work in New York City and has a large circle of friends. The readers of the *Chronicle* are to be congratulated upon Dr. Wood's accession to its editorial management.

New Elevating Tool Post.

An elevating tool post for use on engine lathes, that will possess all the rigidity of the ordinary tool post, is a very desirable appliance. Many devices for accomplishing this purpose have been brought out from time to time, a number of which have been steps in the right direction.

The tool post shown in the accompanying engravings has been made and used for some time past, with entire satisfaction. The simple details of its construction will be apparent from the engravings. Fig. 1 is an elevation of tool post; Fig. 2, a plan and half section, and Fig. 3 is a vertical section. *A* represents the outside, or cast-iron shell, having a hole carefully bored, to which the nut *J* is carefully fitted. The steel screw *E* has a square thread fitted to this nut, and is used for raising and lowering the steel tool post *C*. This tool post is fitted to the nut by a conical-shaped bearing *I*, which allows the tool post to be turned in all directions, to suit the character of the work. A steel bevel gear, *H*, is attached to the bottom of the screw *E*, so that by applying the wrench shown in Fig. 5 to the square, and turning it, motion is transmitted through the pinion *F* to the gear *H*, thereby raising or lowering the tool post, as desired.

The tool always rests firmly upon the steel ring *D*, in a horizontal position, so the difficulties which ordinarily appear in tipping the tool, to elevate or depress it, do not appear in using this tool post. Furthermore, the point of the set screw for securing the tool is not readily broken, nor flattened and upset, because it always has a square bearing upon the tool.

By the peculiar construction of the screw *K*, Fig. 2, the shell is closed upon the nut *J* just tight enough to allow it to move up and down, by the wrench applied to the square *G*. Fig. 4 shows the details of the screw *K*, *A* representing the shell. The screw *N* has two diameters, one end being fitted to the casting so, that by tightening the screw by applying a wrench to the flat part *M*, the pressure upon the shell may be permanently adjusted for all ordinary work. In doing heavy work, however, by applying a wrench to the nut *O*, an extra pressure may be applied, to hold the tool post more securely. After the job is finished, the nut *O* is to be slacked off, the screw remaining stationary. A piece of leather is placed in the opening *L*, to prevent the entrance of dirt.

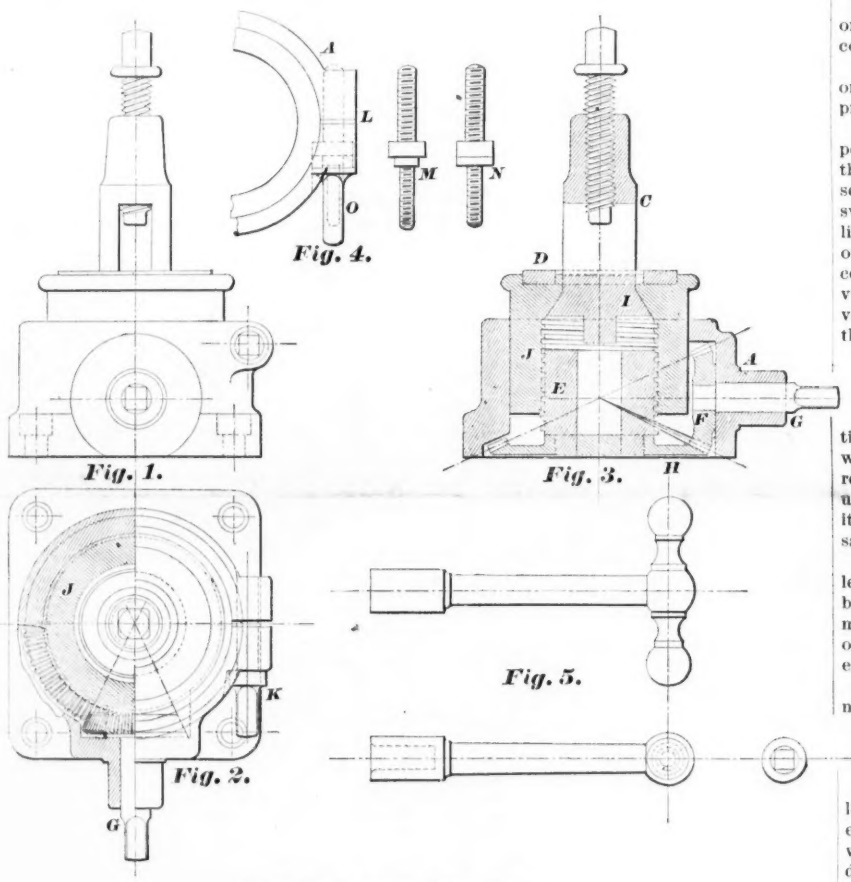
It will be clearly observed that the gear and other working parts are effectually protected against the damaging effects of chips and dirt that would otherwise get into the bearings. The working parts of this tool post are positive and quick in their action, so that the tool may be raised or lowered, adjusting the depth of cut, without withdrawing the tool from the work and stopping the lathe. The power applied to raise the tool is applied from a common center, which has a very rigid bearing upon the carriage, hence the tool cannot gouge into the work in changing the position of the tool.

This tool post can be readily applied to any lathe, by simply planing off the top of the slide upon the carriage and bolting the tool-post upon it by four bolts, as will be understood from the engravings. Instead of applying a tool post to the top of the nut, when desired the nut has a slot across the top, the same as the slide upon ordinary lathes, for the reception of a tool post of the usual style, or an extra nut can be supplied, made in this way.

The object of this extra nut is to permit the application of a vise-jaw to the top, when the lathe can be used as a milling machine. Instead of the vise, an angle-plate can be substituted, to which work can be bolted and the lathe used as a horizontal boring machine. When desired, an emery grinder can also be used in place of the vise and angle-plate, thus converting the lathe into a grinding machine.

When used as a grinding machine, the lathe shears should be carefully excluded from the emery. When desired, knurled wheels are used instead of handles, for elevating and lowering the tool post, while on larger lathes hand wheels are substituted. From the description, it will be understood that all the parts subjected to wear are of steel, while those liable to be bruised are case-hardened

This tool post is made by Charles A. Lieb, 121 Nassau street, New York.



NEW ELEVATING TOOL POST.

Electric Lighting in Mills.

BY C. J. H. WOODBURY.

EXTRACTS FROM A PAPER READ BEFORE THE NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION, OCTOBER 25, 1882.

Another matter of value in electric lights is the ability to distinguish tints. The light from the tips of the carbons is white, and the light of the arc between them is a bluish-purple, so that the general tint of the arc is that bluish-white, which has a very white appearance.

Where the use of shades of color is involved, electricity furnishes the only artificial light which can be feasibly used; and in such cases where the operation of a certain department would otherwise be limited to the duration of sunlight, the economy from the use of the electric light is, to a certain extent, proportionate to extra profits accruing from this extension of the time of labor.

In other departments of manufacturing, the aid to the production of perfect work, by this improved illumination, is a source of additional revenue, because the proportion of damaged goods usually made when the mill is badly lighted, is thereby diminished.

* * * * *

It is sometimes assumed by those ignorant of the facts that electric lighting apparatus cannot set a fire. Electricity is no exception to other forms of energy. All power can be converted into heat.

Your mills are equally liable to hot bearings, whether the motive power is derived from the fires under the boilers, or the head of water in the mill pond.

Whenever anyone states, as a principle, that the electricity used for lighting cannot set fire to anything, he is not only in error, but is uttering a fallacy which will lead to the destruction of property, if carried into effect in any electric lighting system.

* * * * *

In the Mill Mutual Insurance companies, there were 61 establishments lighted by electricity up to last May.

With few exceptions, the lights had not been in use previous to the autumn of 1881, and many had been started early in the spring.

In these 61 establishments I know of 22 fires due to electric lighting, and assignable to the following causes: Eight were from globules of melted copper, or particles of hot carbon falling out from the bottom of the globes. The actual number of fires from this cause was probably many times this number. That class of fires will not continue to happen, as all makers now set their lamp globes in a tight stand, with a ridge around the edge. A flat plate will not answer the purpose, as there was one instance where drops of melted copper rolled off and set a fire.

Four fires were due to leaking water or washing floors, and two more were caused by water in a dye-house condensing on the building to which uninsulated wires were fastened. In most of these instances, a grounded circuit formed one of the two connections necessary to divert the electricity from the wires. Many of the lower carbons fell from lamps, and five fires were caused where they fell upon combustible material. Three fires were caused by cross arcs from one wire to another, where uninsulated wires were fastened against conductors. In one instance the conductor was formed by dust settling upon uninsulated wires, and on a damp day it absorbed enough moisture to form a path for the formation of a cross arc, which started a slight fire.

In another instance, the wires were fastened to a damp beam, which was decayed, and was burned nearly in two by the smouldering fire. And, in the third instance, damp brickwork in a tunnel was a sufficient conductor to establish an arc which did not do any material damage there, but injured the dynamo. Other fires produced by cross arcs started by water, forming a connection between two wires, have been referred to.

In my connection with electric lighting matters for the Underwriters' Union, I know of two fires caused by improper switches; two by water reaching the wires of a circuit already grounded; and one from wires coming in contact with a building, so that their insulation was worn away.

I believe that all these fires should be classed as avoidable fires, because the use of well known precautions would have anticipated their possibility.

The precautions are known only as a matter of experience, because there was no source of information stating the results from electric lighting currents under certain circumstances.

* * * * *

In preparing the regulations for the Fire Underwriters' Union,* I did not ask for any precaution not found by the experience of accidents and actual fires to be essential to protect either person or property.

*REGULATIONS

Of the Boston Fire Underwriters' Union for the Use of Electric Lighting Apparatus.

WIRES.—Conducting wires over buildings must be seven feet above roofs, and also high enough to avoid ladders of the Fire Department.

Whenever the electric light wires are in proximity to other wires, dead guard wires must be placed so as to prevent any possibility of contact, in case of accident to the wires or their supports. Conducting wires must be secured to insulated fastenings, and covered with an insulation which is water-proof on the outside and not easily worn by abrasion. Whenever wires pass through walls, roofs, floors or partitions, or there is liability to abrasion, or exposure to rats and mice, the insulation must be protected with lead, rubber, stoneware, or some other satisfactory material. Wires entering buildings must be wrapped so that water cannot enter through the tubes.

For inside use, loops of wire must be avoided, and the insulating fastenings arranged to keep the wires free from contact with the building.

Joints in wires to be securely made and wrapped. Soldered joints are desirable, but not essential. Wires conducting electricity for arc lights must not approach each other nearer than one foot; and for incandescent lamps, the main wires must not be less than two and a half inches apart.

Care must be taken that the wires are not placed one above another, in such a manner that water could make a cross connection.

A cut-out which can be operated by the firemen or police must be placed in the circuit in a well-protected and accessible place.

LAMPS.—For arc lamps, the frames and other exposed parts of the lamp must be insulated from the circuit. Each Lamp must be provided with a separate hand switch, and also with an automatic switch which will close the circuit and put out the light whenever the carbons do not approach each other, or the resistance of the lamp becomes excessive from any cause. The lamps must be provided with some arrangement or device to prevent the lower carbons from falling out, in case the clamp should not hold them securely.

For inside use, the light must be surrounded by a globe, which must rest in a tight stand, so that no particles of melted copper or heated carbon can escape; and when near combustible material, this globe must be protected by a wire netting. Broken or cracked globes must be replaced immediately. Unless a very high globe is used, which closes in as far as possible at the top, it must be covered by some protector reaching to a safe distance above the light.

For incandescent lamps, the conducting wires leading to each building and to each important branch circuit, must be provided with an automatic switch or cut-off, or its equivalent, capable of protecting the system from any injury due to an excessive current of electricity.

The small wires leading to each lamp from the main wires must be very thoroughly insulated, and if separated or broken, no attempt made to join them while the current is in the main wires.

DYNAMO MACHINES.—Dynamo machines must be located in dry places, not exposed to flyings or easily combustible material, and insulated upon wood foundations. They must be provided with devices capable of controlling any changes in the quantity of the current; and, if these governors are not automatic, a competent person must be in attendance near the machine when it is in operation.

Each machine must be used with complete wire circuit; and connections of wires with pipes, or the use of ground circuits in any other method, is absolutely prohibited.

The whole system must be kept insulated, and tested every day for ground connections at ample time before lighting to remedy faults of insulation, if they are discovered.

Preference is given for switches constructed with a lapping connection, so that no electric arc can be formed at the switch when it is changed; otherwise the stands of switches, where powerful currents are used, must be made of stoneware, glass, slate, or some incombustible substance which will withstand the heat of the arc when the switch is changed.

* * * * *

Electric lighting should be encouraged on account of its inherent qualities of safety. Any system that is in conformity to the insurance regulations is also in its best condition electrically.

Electricity, like all forms of energy, is dangerous to the extent that it is not held in control. The same is true of steam in boilers, or water in mill ponds. Like fire, they are all "good servants, but poor masters."

It is said that not only the oldest but the largest chain bridge in the world is in China. It is used for making a roadway from one mountain to another.

Improved Rolling Mills.

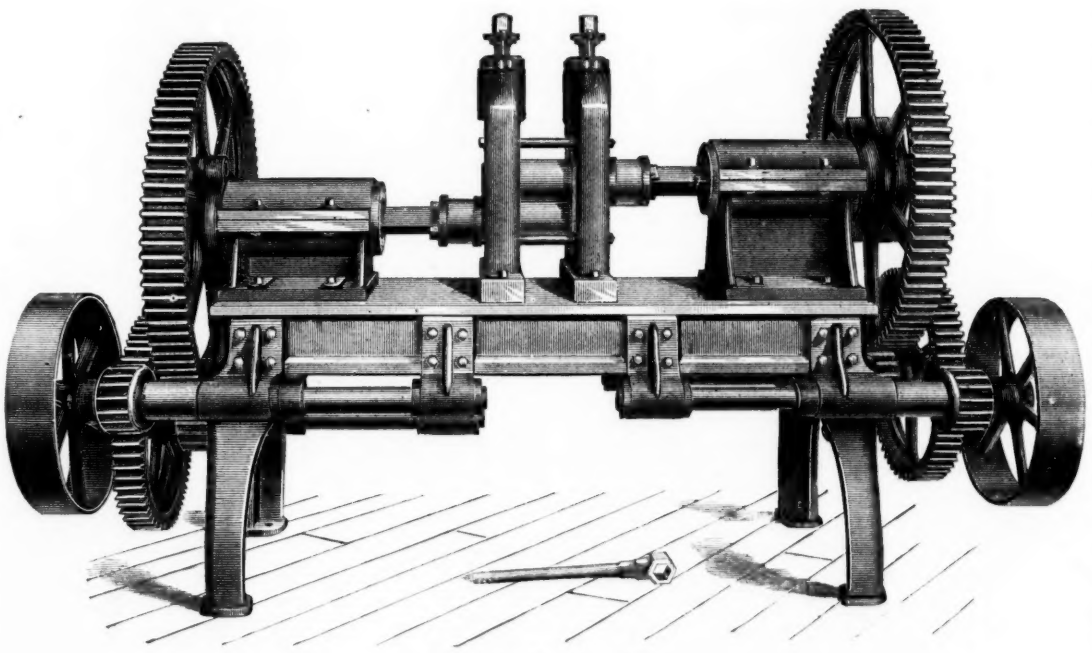
During the past eighteen months, Blake & Johnson, of Waterbury, Conn., have made new and improved patterns of all kinds of rolling mills heretofore made by them, besides adding to their catalogue several new designs.

Herewith we present an engraving of one size of their improved graded rolling mill, for rolling spoons, forks and ladles. This one size of rolling mill is susceptible of being made to use any diameter of roll from four to six inches inclusive—the larger diameter being required for rolling goods of any considerable length. The shafts connecting with the rolls are hollow, allowing the shackle bars or roll connections to pass through them and connect by means of coupling boxes outside of the main driving gears, giving the advantages of a long shackle bar without the additional length of machine.

Where graded or irregular formed rolls are geared together in a manner to give to each the same number of revolutions, at times the face surface of one roll must have a velocity different from that of the other, causing a disturbance in the uniformity and finish of the pieces being rolled, besides adding to their propensity to slip and not feed into the rolls, also adding to the rolls' propensity to heat.

It will be noticed that in this new rolling mill, each roll is driven by a separate belt, the velocities of which are theoretically the same, but in practice the belts yield before slipping the roll surfaces over the pieces being rolled. The common custom of using turpentine on this kind of roll to overcome the propensity of the pieces being rolled to slip back and not feed into the rolls, may, in many instances, be dispensed with, and the rolls put at a high velocity with a stream of water running upon them to keep them cool, thus increasing their production.

By overcoming the tendency of the rolls to slip, much less power is required to do the same work, resulting in economy, not only as to the power required, but also as to the wear of parts, and quality of products, all of which may be classed under the head of cheapening production.



IMPROVED ROLLING MILL.

Locomotive Notes.

HARD RIDING ENGINES.

BY ANGUS SINCLAIR.

Some engines ride so roughly that a man may be excused when he first steps on them for supposing that two or three springs have been left off. A hard riding engine inflicts untold cruelty upon enginemen, but this generation of railroad men does not know anything about hard riding engines, when compared with the experience of men who pulled the throttle twenty or thirty years ago. The advance in balancing and equalizing weight on running gear, which has produced the wave-like gliding motion common with good coaches, has also been applied with successful effect on locomotives; so that the engine which rides like a lumber wagon is becoming a rarity on most railroads. When such a case is met with in engines of modern build, the roughness is generally caused by some local defect. Engines that are nearly worn out sometimes get rather tumultuous from discordant jars, but they seldom develop the ability to shake the teeth out of a man's head, which was common with old timers in like condition.

British railways are popularly believed to be noted for smooth road-beds and splendidly maintained track, a characteristic which they have deserved ever since the incipiency of the British railway system. But the men who ode the engines running over those roads a quarter of a century ago, must retain unpleasant recollections of how the locomotives rattled and jolted along. Building locomotives did not immediately become a specialty with certain shops, as was the case in this country, where the best skill and appliances were devoted to the business. Stationary engine building was carried on by innumerable small concerns before Stephenson's time, and when the inventors of the locomotive produced a successful working engine that was not covered by patents, every machine shop and foundry in the country aspired to compete in the work of locomotive building. This produced a multitude of curious machines. Railway companies seemed to make but three leading requirements in the locomotives they ordered. A multitubular boiler, and two cylinders and driving wheels were common to all makes, but the remaining details varied according to accident, or the fancy of the various makers. To this beginning is due the present want of uniformity in British locomotive building. Springs were required to carry the weight of the engines, but they were not arranged according to any intelligent design, and in many instances their absence would have been but small loss.

I retain yet, in a vivid way, the memory of some tremendously jolting rides of twenty years ago, on a small single coupled engine, with six feet drivers, and leading and trailing wheels about 30 inches in diameter. The principal aim of the designer of the engine seemed to be, to get as much weight as possible on the drivers; and to effect this end the trailing wheels were robbed of their proper share of weight. These trailing wheels got their weight from a single spring crossed under the foot plate, with the ends resting on the axle-boxes. The engine was like a beam balanced on a central pivot, which was the drivers, and the leading and trailing wheels acted as supports to sustain the vibrating lurches. The effect of this arrangement was that the engine progressed in a succession of bounces. When she struck a bad joint, which was pretty often, she would jump the engineman almost off his feet. I used to think that the trailing spring was an entirely useless attachment, till one day when piloting—that is assisting—the London express, the thing tumbled out I put in wooden blocking between the frames and axle boxes, then had to rush along on running time. I once rode in a coach from Leadville, Colorado, through the South Park, and the road was strewn with bolders as large as head-lights. The driver was drunk beyond fear, and he kept the eight mules going regardless of rocks, and we miserable passengers had to hang to the seats to keep our heads from bounding through the coach roof. That was a rough ride; but it was pleasant compared with the jolting I got on that little passenger engine ahead of the London express, with the trailing spring gone.

To make a smooth riding engine, the springs and their connections must be so adjusted and equalized, that all shocks and jars received by the wheels, from rough or defective track, shall be transferred to the springs. Any defect, or mal-adjustment which makes the springs fail to equalize the shocks so received, has a tendency to produce a rough-riding engine. The springs, to carry the engine with an easy wavy motion, should be flexible enough to absorb the shocks by yielding to them; but the elasticity should not be sufficiently great to permit the boxes to strike the frame or the pedestal braces. When the running gear of a locomotive is properly equalized, each box of the engine truck receives the same weight to carry, and all the driving boxes sustain equal loads. In this condition the springs and equalizers stand level, parallel with the frame and in line with each other. The axle-boxes occupy identical relative positions in the pedestal jaws, each one being about the same distance from the top and bottom of the pedestals, with equal room for vertical motion.

The first and leading disturbing element to the smooth running of locomotives is inflexible springs. From mistaken views as to strength, or from some other erroneous idea, there are makers who equip locomotives with short, stunted springs, that have to yield to ordinary tension or blows. Besides enhancing the comfort of the engine as a riding vehicle, springs perform a most important function in softening the concussions between the running gear and the track. Every man who has used a hammer and cutting tool knows that a blow, to be properly effective, must be met by an unyielding substance. Hence, the blacksmith uses a solid anvil, where a forging is quickly educed to shape from the blows of a solid hammer; the boilermaker holds the rivet to his solid blows by means of a solid sledge; the machinist chips his fittings quickly and accurately by holding them in a solid vise. And on the same principle, the locomotive whose springs fail to soften the concussion caused by bad joints returns a solid blow to the rail, pounding wheels and rails out of shape; and every part of the engine is rattled and hammered and shaken by the rude shocks inseparable from railroad service—shocks that cannot be prevented, but which may be rendered comparatively harmless by good springs properly equalized. Every attachment of a hard-riding engine suffers from its habitual roughness, but the greatest sufferers are the enginemen, who daily ride ten or twelve hours in the cab.

On a north and south road in Iowa, there was once a group of passenger engines that had short, stout springs. The road was young then, and its track was rough. Pretty good time had to be made nevertheless, and the engineers asserted that their bones were nearly shaken out of joint by the engines riding so hard. Hardly a trip was made without breaking one or two springs. A new master mechanic took hold one day, who understood the principles of mechanics, and put them into practice. He shortened the equalizers and lengthened the springs. This cured the hard riding, and the breakage of springs almost ceased.

It occasionally happens, from various causes, that an engine does not rest level on the axle boxes. The frame may be clear away from the forward boxes, while it crowds down upon the packing of the back boxes. Or the high and low boxes may stand diagonally across from each other. Either of these conditions has a tendency to produce a hard-riding engine, for the weight is not properly equalized. One axle is getting more or less than its correct load, and, as the equalization levers are opposed to unequal distribution by weight, the high point lets the pedestal brace pound the bottom of the axle box, or the frame strike the saddle, and at the low point the frame hammers the top of the axle box. The equalizers are like the beam of a balance hung on the center. When the weight on each end is equal, the beam stands level; when one side outweighs the other, it dashes down on the counter. The equalizers of a locomotive are the beams that weigh the engine in the balance. I heard an engineer remark to-day, "You cannot make an engine ride easy unless she stands on an even keel," and his marine phraseology proclaimed the truth. If the front end of the engine should be too high for the drivers, the tendency will be to raise the frame away from the front boxes, and depress it upon the back boxes. No manipulating of hangers will make such an engine stand level on the driving boxes. An unduly low front end will reverse the inequality. But, whatever way it appears, the result will be the same. Boxes and ends of equalizers hammer the frame, each stroke producing a jar from pilot to drawbar.

Another cause for rough riding is badly fitted, or unequally worn wedges, shoes or axle-boxes. This produces obstruction to the vertical motion of the boxes in jaws, like the wedges sticking for an instant and then letting go. The box catches in the jaws long enough to impart a blow direct to the frame, instead of through the spring. Wedges that are not planed to the proper taper are bad, causing this trouble. They cannot be set up close without holding the boxes fast.

Wedges, shoes or boxes, cut or worn hollow in the middle of their length have a similar effect. An engine whose wedges catch or stick to the boxes is the worst kind to ride on.

The jerky movement peculiar to an engine out of tram is uncomfortable to endure on a long trip. Some engines suffer chronically from this tumultuous motion Inaccurately quartered crank-pins, or an axle slightly sprung—just enough to cause discomfort—will make an engine ride as if she was always out of tram. Lost motion in the driving-box brasses, journals, and pins out of round, throw unequal stress upon the rods and running gear, and make the engine ride hard. Akin to the discordant movement caused by an engine being out of tram, is the discomfort and trouble which follow an engine that is badly counterbalanced. The counterbalance weights attached to the drivers of locomotives are placed there to balance the weight of the cranks, pins and connecting-rods. But for this arrangement the revolving wheels would be much heavier on one side than on the other, which would produce a convulsive motion, the heavy part tending to descend the circle of revolution with greater velocity than it would incline to ascend it. In practice, it is found that badly counterbalanced locomotives run with a springy horizontal motion, each turn of the wheels making a distinct pull on the drawbar. This is most apparent and most annoying when an engine is making good speed

with a light train. In such a case the fireman generally finds more work shoveling the coal off the deck into the tender than into the fire-box. Engines are as often too heavily counterbalanced as they are deficient in the required weight, and the effect on the working is about the same.

Rough riding, on account of bad wheels, is not so common nowadays as it was twenty years ago. Worn tires, that are hollowed till there is a flange for each side of the rail, make uncomfortable riding, but even this condition is nothing like what old-timers remember as having endured from chilled drivers, and iron tires that habitually wore out of round. Flat drivers are very rare with good steel tires, and when they do appear in that state the beginning of the flat spot has generally been caused by sliding the wheels, although, occasionally, a soft spot will become flat by honest wear. A flat spot on a tire will sometimes make a thump in running, which is liable to be mistaken for something else. One day, Tom Jones, an old runner, who pulls a passenger train on the Missouri Southern, walked into the roundhouse and reported to the foreman that his engine had got a pound which he had failed to locate. It was a funny kind of a pound, he said. While running at speeds below twenty miles an hour, it was not there, but as the speed increased the pound grew; softly at first, but by the time forty miles an hour was reached the pound sounded violent enough to pull the rods off. A search was instituted, and everything was examined likely to produce such a commotion, but nothing was found wrong. Several more trips were made, each one succeeded by a searching scrutiny to discover the cause of the thumping. The trouble was eventually located in one of the drivers. A spot about eighteen inches long, on the periphery of the tire, was wearing out of round, but it was not out far enough to be heard at low speeds. Like many another growing defect, high velocity was required to demonstrate its presence.

We learn that a large city which is in need of the services of an expert civil engineer for special work is sending letters to a number of such persons, asking their terms. This is a penny wise and stupid way of doing business, and suggests a very low order of intelligence on the part of municipal authorities. Engineers of ability and reputation are not to be obtained by this kind of dickering.—*Sanitary Engineer.*

LETTERS FROM PRACTICAL MEN.

Grinding a Scraper.

Editor American Machinist:

My scraper worked well at first; it was a new one, made of $\frac{5}{8}$ octagon steel flattened down at one end. A double-end scraper is not easy to the hand. I ground the corners back, leaving it full in the middle, and used an oilstone in approved style.

Whenever it got dull, I held the end against the grindstone carefully, but did not think it necessary to pay much attention to the sides after the first grinding. I followed this plan until the scraper would scarcely take hold at all. I thought it had worn back beyond the hardening, or, at any rate, that it was too soft.

I took it to the tool-dresser to get it hardened, and he dressed it over, and it worked all right for a while, and then came the old trouble of slipping over the work, as if too soft.

To make sure of getting something hard enough, I took an old mill-saw file and ground that into a scraper.

This promised well; no slipping over, not at first, but with use and grinding the old file got soft, or something else, and would not take hold.

I inquired around to find out the mystery of a scraper refusing to work, but could only hear that they sometimes would do so; perhaps they were too soft.

Every time that I took one to get it hardened, the tool-dresser would at once dress it over. It would work then; but I could not tell whether it was the hardening or the dressing that did it. The smith did not seem contrary about it at all; he dressed it as a matter of course, or as if he thought I would stay away longer if he dressed the scraper.

I had heard barbers say that razors needed to be put away for a rest once in a while, and I had read that the component parts of machinery need rest, to prevent torsion and compression sets, or crystallization, or something of the kind, and I began to think that scrapers needed a rest.

One day the blacksmith was in a great hurry, and he hardened the scraper without hammering it at all. I held the end against the grindstone, as usual, and then thought I would brighten up the sides, as if it had been newly dressed. In doing this, as I approached the cutting edge, I could see that it had worn to a bevel, corresponding to the angle at which I had held it in scraping; and in grinding the end only, I had not ground back beyond the bevel. I ground the bevel from both sides, and followed up that plan, and had no more trouble.

I could then understand that a scraper, being pressed hard on the work, will lose its clearance sooner than will a planer tool which is not pressed on its work.

H. S.

Springs vs. Air Cushions for Printing Presses.

Editor American Machinist:

As it is to be presumed that at least one of the objects of such a descriptive article as is given on the first page of your issue of Oct. 28th, on an "Improved Two Revolution Printing Press," is to impart correct information to the users of such machines, as well as to laymen in printing machinery, it appears to the writer that it would be very desirable that erroneous statements as to the principles involved in other machines should not be allowed to go unchallenged; and that such erroneous statements do therein occur, I propose to show.

A considerable part of the article is devoted to an attempt to exhibit the air spring as not only a theoretically perfect device, but, as arranged in the press described, the only theoretically perfect spring apparatus for a printing press. It is also implied, if not expressly stated, that steel wire springs cannot be correctly adjusted for varying speeds, or as easily disconnected when it is desirable to turn the press over the centers by hand, all of which I propose to show are precisely the reverse of the facts of the case, and very likely to mislead anyone not thoroughly expert in the business.

I quote, "the proper tension of a spring to arrest the motion of a reciprocating body varies with the speed and weight of the body." As it is previously explained that one of the functions of such a spring is "to start it in the opposite direction," this may be added to the first quotation. In other words, the function of a spring as used in connection with the reciprocating bed of a printing press, is to absorb and transmit to the machine as a whole, in an easy manner, the momentum of the bed while bringing it to rest, and to give out in the same gradual manner an *equal* force to start the bed upon its return stroke. But the article states that when performed by means of steel springs, the adjustment necessary for varying speeds "is not readily made, nor indeed, cannot, generally speaking, be satisfactorily made at all with a steel spring."

To quote further: "another unfavorable feature with the steel spring is, that in making ready it offers an uncomfortable resistance to the necessary movement to and fro of the bed, thus hindering the pressman in his work and requiring the performance of unnecessary labor."

Now, in the first place, it may easily be shown that the air spring is not theoretically correct in its action, from the fact that owing to the constant radiation of the heat from the surface of the air chambers evolved in the compression of the air within them, they can never give out the force equivalent to that exerted by the moving mass in compressing the air; and further, that as used in the press described, the use of the governor and vacuum valve for varying the pressures in the chamber insure a still further departure from the theoretically perfect spring, from the fact that some force is required to open both the relief and vacuum valves. The steel wire spring, on the contrary, when properly constructed and applied, does act, within extremely narrow limits, as to friction of coils upon the rods, theoretically correct, giving out precisely what it receives.

In the second place, with steel wire springs, the adjustment is readily made—quite as readily as "by moving the air-spring plungers backwards or forwards on the rod by which they are connected to the frame," and in some machines the writer has designed much more readily; while in place of the "table of pressure suitable for different speeds," there is a simple index upon the adjusting arc giving the speeds themselves.

Again "the plunger is fitted with spring packing so as to allow the packing to expand to fill the cylinder," all of which, through the friction created, detracts materially from this device acting as a theoretically perfect spring, acting as it does to retard the bed in both directions; an objection to which the steel wire spring is not liable.

Now, as to the "uncomfortable resistance offered by steel wire springs to the necessary movement to and fro of the bed," one would infer from the article that no provision can be made for the release of the tension of wire springs when desired, and that the air spring attended by a governor, offered the only possible means of bringing about this desirable release. That such a statement is misleading and unfair it is only necessary to say that printing machines are being built daily under the writer's supervision, and from his designs, in which wire springs are released at will by a simple movement of the feeder's foot, and that similar provision is made in many other machines of others, design, having springs of steel wire.

To conclude, I have only to say that I am making machines every day in which steel wire springs perform their functions in a theoretically correct manner (such as is inherently impossible with the air spring), varying their tension at will from a fixed zero point for varying speeds, and increasing their tension by increase of accumulation only from the zero point; *i.e.*, without change of initial tension, and disconnected momentarily at the will of the feeder; all of which would seem to be impossible, if the article in question was correct in its statements.

FERRUM.

[We publish the above communication without present comment. In justice, however, to those whose experience may differ from that of our correspondent, we shall afford any such an equal opportunity to express their views.]

Calculating Engine Power—Boiler and Engine.

Editor American Machinist:

In making a table of multipliers, for obtaining the horse power of an engine at various piston speeds and mean effective pressures, I find that at 55 lbs. M E P and 600 feet piston speed, the gross horse-power is just equal to the area of the piston in square inches; thus a 6″ bore has 28.27 gross horse-power. An 18″ bore 254.47, &c.

How can an engine maker make or warrant an engine to furnish an indicated horse-power per hour on two or three pounds of coal, as "Starting Bar" suggests, unless he puts in the boiler and stack? One boiler will make 12 lbs. of steam to another's 6 lbs., with same coal.

R. GRIMSHAW.

430 Walnut street, Philadelphia.

A Wrinkle for Finding the Area of a Circle.

Editor American Machinist:

I make use of a "wrinkle" in finding the area of odd diameters not given in the tables of areas.

For instance, to find the area of a circle 1.66 diameter, which is not in the table. Look for the area of ten times 1.66, and this will be one hundred times the area of 1.66, in accordance with the law that the area increases as the *square* of the diameter.

Therefore, by the table:

Area of 16.6 = 216.4248;
and " 1.66 = 2.1642.

This can also be easily applied to the table of eighths and sixteenths. For instance, to find the area of $1\frac{1}{16}$, which is not in table:

$1\frac{1}{16} = 1.0625$, which multiplied by 10 = 10.625 $= 10\frac{5}{8}$,
and area of $10\frac{5}{8}$ by table = 88.6643;
therefore, " $1\frac{1}{16}$ = .8866.

If ten times won't bring a number in the table, try one hundred or one thousand times, and the law will hold good.

GREASER.

Teeth of Gear Wheels.

Editor American Machinist:

In your issue of November 18, F. G. Woodward, among other valuable suggestions, makes the following: "That gears have less depth of tooth, pitch being the same." Knowing that this is an important point in machine practice, and I might say a radical change in gear work, I think it should be more fully noted than it was in Mr. Woodward's article. As I have never seen any rule for proportioning the depth of gear teeth, which made the depth less than .6 of the pitch, *plus* bottom clearance, I would suggest the following, which in practice has proved all that could be desired, and is used by a firm in this city, where a large number of gears are used:

One-fourth of pitch for face of tooth.

Five-sixteenths of pitch for flank of tooth.

This gives one-sixteenth bottom clearance, and, if the curve at base of tooth is equal to the clearance, it makes a very strong tooth.

As an example of the working of this plan, I would say that the firm alluded to built a machine with 170 wheels, cut as above indicated, and at a speed of 400 revolutions they worked remarkably quietly.

Z.

Boiler Inspection.

Editor American Machinist:

The paper on "Steam Boiler Inspection," by F. B. Allen, published in the MACHINIST of Nov. 17, should be read by every person using a steam boiler. A significant statement made in this article is that, out of over 17,000 boiler inspections made during the year 1881, over 21,000 were considered sufficiently defective to require special mention by the agent of the company making the inspection.

I cannot see any good reason why there should be legislation regulating the construction and use of marine boilers, any more than for those used for other purposes. Surely the public safety is endangered as much in our large mills and factories, where many boilers are used, as on river or seagoing vessels.

It is notoriously true that a great many new boilers are being put into use daily that, if subjected to a test, and especially that employed by marine inspectors, would not pass inspection.

I hope to see the time when all builders of boilers will be required to comply with fixed rules and regulations governing the construction of steam boilers, and the same apply to users as well.

DYNAMICUS.

Two Kinds of Machine Shops.

Editor American Machinist:

There seems to be an impression that large machine shops are better conducted than small ones; but this is not always the case. One of the most systematically conducted and best furnished shops, with first-class tools, that I ever worked in, was a small machine shop where the number of lathes did not exceed 20. The proprietor, when he started, did not have a capital of more than $5,000, but he got large orders, and every cent he made for some years was expended in first-class tools. He invented a machine which he got patented, and made a large fortune.

His lathes had all conical journals and were all furnished with compound rests; also hand rests, three face plates, and a variety

of chucks of different make, a stationary stay or steady rest and a back-stay, or traveling rest furnished with boxes and binding-screws. There was very little fitting done with outside and inside calipers. Standard steel gauges, templates, bits, etc., were used.

His plan was to keep nothing but first-class workmen and apprentices. Considerable dissatisfaction was expressed by the men on account of his keeping so many of the latter. His motto was "plenty of tools and plenty of boys." The apprentices had to serve long terms for low wages, so that he made considerable profit out of them towards the last.

On the other hand, I once worked in a machine shop where the proprietors were very wealthy, but had not been brought up to the trade. Everything was done on the "cut and slash system." For instance, an iron mandrel would be fitted to a hole 4′ in diameter and then turned down and re-fitted to a smaller hole. There were no chucks or angle plates, or steady rests, or false bearings attached to their lathes. Wooden blocks, wooden chucks, and wooden steady rests were used for everything. A carpenter was kept regularly at such work on hardwood for the machinists. The consequence was, the men were half of their time in the carpenter's shop waiting for blocks and chucks, getting ready for new jobs.

If a long propeller shaft had to be turned, that required to be supported in the middle, a man was expected to pick up a collar somewhere, key it on with wedges, and then get a temporary wooden arrangement for it to run in. There was as much fuss getting wooden blocks for boring cylinders. In fact, the shop was run on the make-shift system, pretty much the same as if a steamboat broke down in mid-ocean. The manager was a good engineer, but was no tool man. There was very little scraping done, but a great deal of grinding with oil and emery, on such work as slide valves, piston rings, etc. All bolts, nuts and bolt heads were turned by hand on old, antiquated lathes, with shears, and the rests were held with a wooden wedge. All threads were chased out of the solid.

There was only one grindstone for all hands; so, as might be expected, it was always in a horrible condition.

The blacksmiths' shop was conducted on a similar principle. A great deal depended on the foreman, and how he had been brought up.

When a new foreman blacksmith that has been trained in a shop where they have tools and system begins, the first thing he does is to put up cranes where needed, and make special blocks, flatter, swages, etc., and racks for the smiths to keep their tongs in; also make new tongs for special jobs, and have no altering or borrowing.

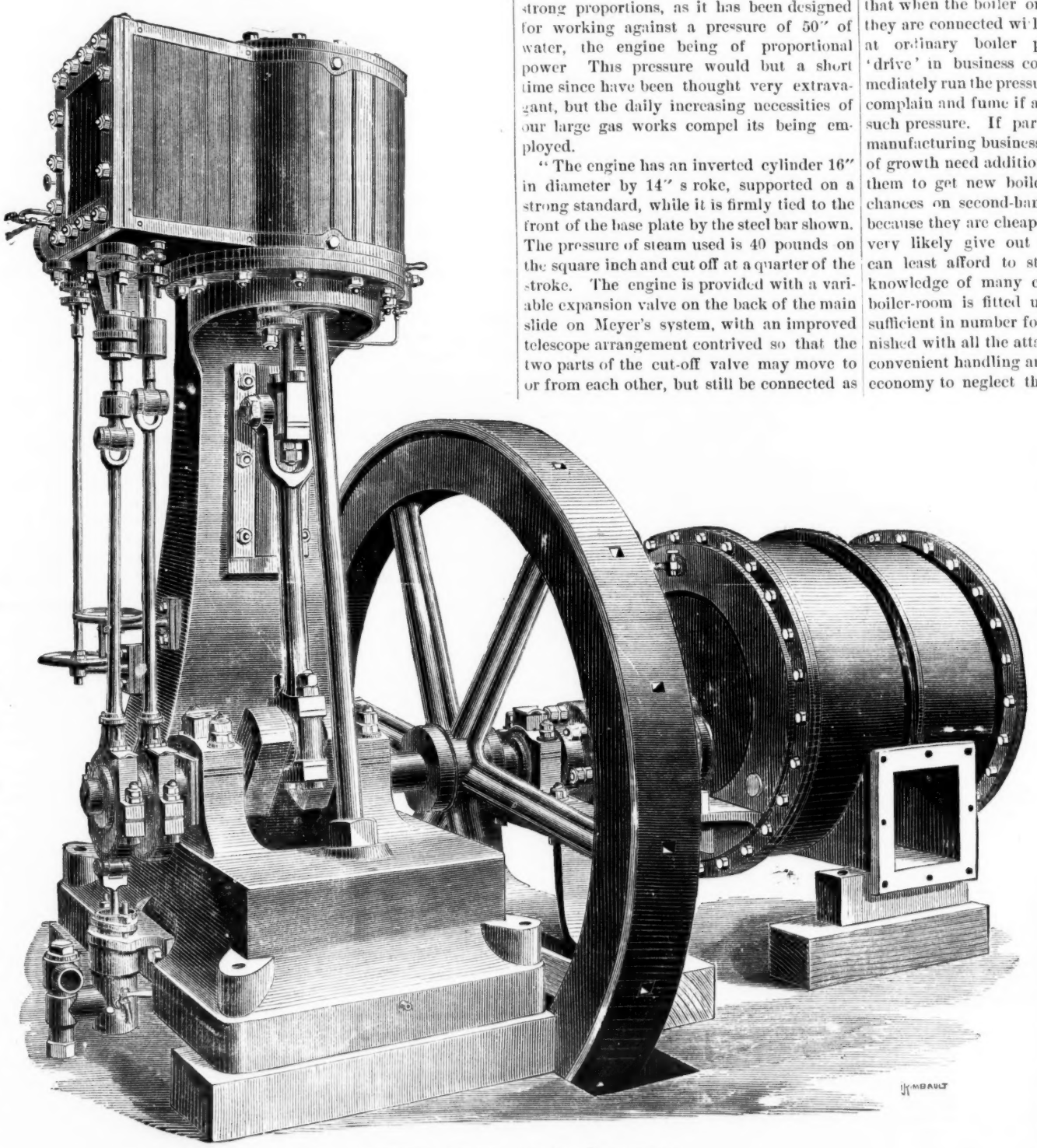
Your correspondent, F. G. Woodward, made some good suggestions on improvements in machine tools in your issue of November 18, regarding legs, foundations, etc., and devices for equalizing the wear of the working parts of screws, etc.

There must be many readers of the AMERICAN MACHINIST who have had considerable experience in the workshops of Britain and France. I should like to hear of their experience on the different systems of working in different shops. Even New York and Massachusetts shops differ considerably in their designs and practice. I am aware that a prejudice exists in some quarters against everything foreign.

That the coarse feed system for the last cut on heavy work is more common than formerly, there can be no doubt. When I first went to the trade, the last cut, in boring cylinders, used to be taken with a fine feed, and hardwood blocks in the boring head. That plan has long since been abandoned, and a truer bore is produced with coarse feed and without the wood. VETERAN.

Fort Wayne, Ind.

One of our most esteemed contemporaries offers as a premium ten popular novels with each yearly subscription. The reader of the average milling journal needs no additional works of fiction, and we fear that the offer will fall flat.—*Northwestern Miller.*



VERTICAL ENGINE AND GAS EXHAUSTER.

Vertical Engine and Gas Exhauster.

For the engraving, and the following description of engine and gas exhauster, built by W. H. Allen & Co., of York Street Works, Lambeth, for the London Gas Light Company, we are indebted to our contemporary, London *Engineering:*

"The exhauster is constructed on the principle known as Beale's patent, but greatly improved and modified by Messrs. W. H. Allen & Co., who employ steel for all the working parts as far as possible, increasing all the internal surfaces and making all the revolving parts lighter, thus reducing the pressure per square inch on the bearings and decreasing the friction. The exhauster now illustrated has been made with unusually strong proportions, as it has been designed for working against a pressure of 50″ of water, the engine being of proportional power. This pressure would but a short time since have been thought very extravagant, but the daily increasing necessities of our large gas works compel its being employed.

"The engine has an inverted cylinder 16″ in diameter by 14″ stroke, supported on a strong standard, while it is firmly tied to the front of the base plate by the steel bar shown. The pressure of steam used is 40 pounds on the square inch and cut off at a quarter of the stroke. The engine is provided with a variable expansion valve on the back of the main slide on Meyer's system, with an improved telescope arrangement contrived so that the two parts of the cut-off valve may move to or from each other, but still be connected as in one piece—an arrangement which effectually cures the vibration so often occurring in this form of valve. By a neat arrangement of brass wheels in the valve spindle guide, the handle for regulating the expansion valve with its index is brought in close proximity to the starting valve lever, so that the machine is under ready control from the ground level. The whole of the working parts, including crank shaft, are of steel, and the lubricators are so arranged as to allow of the engine working continuously.

"These exhausters, when working in connection with the new vacuum governor made by Messrs. Allen & Co., show a remarkably steady gauge. We have seen diagrams taken from one of them indicating a twenty-four hours' record, in which the variation did not exceed $\frac{1}{8}$″ beyond the usual oscillation of the exhauster. We have on several occasions had to speak of the high-class workmanship turned out by Messrs. W. H. Allen & Co., and we need only say that the exhauster and engine now described fully maintain the reputation of the firm in this respect."

Second-Hand Boilers.

We clip the following sensible remarks from *The Locomotive:*

"Manufacturers often purchase second-hand boilers because they are cheap. Now this may be well enough if, upon examination, they are found to be in fair condition, and are to be used only at low pressures for heating water, heating buildings, or some such purpose. But it very often happens that when the boiler or boilers are secured they are connected with the engine and used at ordinary boiler pressure, and if a 'drive' in business comes, the owners immediately run the pressure up excessively, and complain and fume if an inspector objects to such pressure. If parties engaged in any manufacturing business which has prospect of growth need additional power, we advise them to get new boilers. Don't take any chances on second-hand boilers for power because they are cheap. If you do they will very likely give out at a time when you can least afford to stop. We speak from knowledge of many cases. See that your boiler-room is fitted up with good boilers, sufficient in number for your work, and furnished with all the attachments required for convenient handling and safety. It is false economy to neglect this department of the establishment, for upon its efficiency depends in a great measure the success of your enterprise. In your eagerness to see a handsome product going out from the front of the mill, dont forget the rear end, where is the power that sets all the machinery in motion. Second-hand boilers are good in their place, but not to be used, as a rule, as though they were new, nor can they be safely rated at the same pressures."

Engineering describes an apparatus by means of which a steam engine may be quickly stopped from any distance, as from any part of the building in a manufactory in case of an accident. To the throttle valve of the engine a small cylinder fitted with a piston is connected in such a way that the piston rod may be made to close the valve. The piston is actuated by admitting steam behind it, through a valve which is opened by the passage of an electric current through an electro-magnet. Thus, when the electric circuit is closed by means of a press-button the current traverses the electro-magnet, and attracting a soft iron armature releases a detent, which allows a weight to fall. This weight in falling operates to open the valve, which by admitting steam to the cylinder closes the throttle and stops the engine. In some large works in England, watchmen are in attendance at every engine, ready to stop it upon the alarm being given. By the use of this device, this is made unnecessary, since by placing buttons, properly protected, on the walls of every room the engine can be stopped from the room where the necessity for doing so is seen, thus saving time, which may be of the utmost importance. When the apparatus is applied to a condensing engine, it operates to admit air into the condenser as well as to shut off the steam supply.

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NEW YORK, DEC. 2, 1882.

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Condition of the Iron Trade.

Beginning with the boom in 1879, the iron trade of this country enjoyed a period of decided prosperity for over two years and a half; then came a slow and gradual decline which has not yet been counteracted. The condition of the iron trade just now, both in this country and in England, is best expressed by the single word, *dull*. It is but reasonable to suppose that had there been no strike of iron workers last summer the market would now be almost demoralized. Contracts for new railroads are not being placed to anything near the extent they were one year ago, and the price of steel rails has fallen as well as that of iron.

As a consequence wages have, in some localities, been reduced and production restricted. It is not our purpose to discuss the causes that have brought about such a condition. Undoubtedly the limited demand for our cereals abroad and the low prices obtained for them has had much to do with repressing new railroad contracts, and consequently the demand for iron and Bessemer steel. Depression of the iron trade may, in some degree, benefit the machinery industries by affording cheaper material for mechanical construction, but, on the other hand, it must somewhat lessen the demand for machinery and tools.

In commenting upon the situation the *Bulletin* of the American Iron and Steel Association takes a rather unfavorable view as may be seen by the following extract:

There is no more sensitive trade barometer in this country than our iron and steel industries. For several months before the occurrence of the panic of 1873 the prices of pig iron and bar iron had been steadily falling. When the hard times which that panic had created were about coming to an end, at the beginning of 1879, the improved condition of our iron and steel industries was the first indication we had of this cheering fact. The present unmistakable tendency to lower prices for all products was clearly foreshadowed by the great drop in the price of steel rails at the beginning of the present year and by the subsequent decline in the prices of pig iron and bar iron. To-day the condition of our iron and steel industries is one of marked and increasing depression, and it indicates that in the near future other industries must be injuriously affected and that lower wages will be paid for labor.

A disposition to reduce wages is the most unfavorable indication that presents itself. If when prices of leading commodities have a downward tendency wages are generally reduced while the cost of living remains the same, general business receives a check that is difficult to recover from. As long as rates of wages do not decline, the outlook is hopeful, as a reduction in the prices of some classes of goods may be only temporary. When workers for wages have steady employment at steady wages general business cannot languish, therefore manufacturers controlling large enterprises should, for their own as well as for the public benefit, hesitate a good while before ordering a reduction in the wages of their employes, even when profits are inclined to shrink.

Small Steam Engine Construction.

The manufacture of small steam engines, from two to fifteen horse-power, although as a business comparatively new, is already one of the prominent machine industries of the day. Unfortunately—so it would seem to the observer—in this business the buyer and the manufacturer have hardly brought their interests to harmonize as well as they might do, and as a consequence too many motors of this class are seen whose appearance impresses the conviction that they are made to sell rather than for use; that is, the commercial rather than the engineering feature is the prominent one. In respect to cost, the buyer has little cause to complain, since small steam engines can be bought at a price that it is hardly fair to criticise. In respect to the quality of many of them, the matter is not so favorable, either from the buyer's or seller's side, since if anything in this respect is worse than for the buyer to buy a poor engine, it is for the manufacturer to find himself obliged to build such engines.

Probably the demand for low prices has more to do with the quality than anything else, as even those manufacturers who start out to maintain the quality are not always proof against the demand for low prices.

One prevailing weakness of small steam engines is lack, both in diameter and depth of stuffing-boxes. This may—looked at in the shop or office—appear to be an unimportant detail, but looked at as the man who has to keep shallow stuffing-boxes packed looks at it, it is a most important one. Besides the annoyance of leaky packing, that requires quite as much attention as the entire engine ought to require, the loss in friction, and wear of rods, in a shallow stuffing-box, in which the small amount of packing must be set up till about as hard as a piece of hard wood, is serious. The direct loss of friction might be put up with, as a few pounds more or less of coal is not always a serious matter, but this friction incidentally results in such a wear of rods that in the instance of many small steam engines, after a few weeks' use, there is no longer any hopes of keeping rods packed against steam pressure.

Another radical fault of small steam engines, spoken of in a general way, is the absence of decent provision for coming at the parts for adjustment, or for separation in the case of necessity. Looked at from the æsthetic point of view, if a steam engine is ever looked at in that way, the prevailing construction may please the eye. Looked at from the economical point of view, *in the shop*, it may be cheap; but looked at as the individual who cares for the engine, in the little 4x6 corner usually devoted to the purpose of an engine room, where he vainly tries to adjust parts that can be come at only in the imagination, it does not appeal to his sense of good looks, and is the reverse of economical. It is one thing to devise ways and means to adjust parts and turn nuts in impracticable corners in the manufactory, with the resources of the machine shop to back the effort, and quite another thing to do it in the quarters to which a small steam engine is usually assigned. The small steam engine of only a few years ago, built—not manufactured— with its inevitable box bed, may excite a smile from the present mechanical generation, but it possessed one feature that covered a good many shortcomings—it could be come at in all its parts.

Still another point of small engine construction that does not generally receive the consideration due it is the extent of wearing surfaces. It is not sufficient that these surfaces shall be ample to run without heating. While simple—the simpler the better—and effective means of adjustment should be provided, the bearing surfaces should be of such dimensions, and of such quality that adjustment will seldom be necessary. For obvious reasons engines of this class do not receive the attention, when in use, that larger ones do, hence the importance of bearings of such dimensions, material and workmanship, as to be little liable to get out of line in use.

The piston packing of small engines is quite generally unsatisfactory; in fact, it is a matter by no means easy to make a good piston for a cylinder six inches or less in diameter. There is not room to use adjustable spring packing, and, on the whole, it is probably fortunate that there is not. The rings must contain within themselves the spring necessary, or packing must be used that will be kept in position by the pressure of steam. It would seem that this last named – that is, steam setting packing — might profitably be used more than it is used, as its cost is not a serious matter.

On the whole, small engines are made *too small*. The small compass into which they are brought crowds the parts beyond all convenience in coming at them, and the small (not weak) proportion of parts makes the cheap engine a dear one to the buyer. A steam engine is valuable only as a useful machine, and should be designed with that end in view, whether the proportions result in architectural beauty or not. Nuts and bolts for use should be in view rather than, as is too often the case, be hidden with such care that they can only be reached with a special wrench that is never to be found except in the shop where the manufacturing is carried on.

It seems that the buyer of a small steam engine will scheme a good deal to save twenty-five dollars, and then suffer a loss of about ten times that amount every year he uses it. If the manufacturer and buyer could get on common grounds, and both look at the matter a little more through the eyes of the man who takes care of small steam engines after they are put to use, they might possibly learn something to their mutual advantage.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(422) E. N. B., Poughkeepsie, N. Y., asks Will you tell me the date of the AMERICAN MACHINIST in which were rules for calculating speeds of pulleys and shafts? *A.*—Sept. 16, 1882.

(423) B. A. K., Newark, N. J., asks: In speaking of the exact counterpart of the bed plate of an engine, is it proper to call it templet or template? *A.*—Either is right, but templet is the more common expression. Consult Webster's Unabridged.

(424) J. P., Savannah, Ga., asks: Why is the thread of car wheels coned? *A.*—So that in passing curves the wheels may so dispose themselves that the one that has the greatest distance to travel will run on a larger diameter, and so prevent slipping.

(425) L. A., Richmond, Ind., asks: What should be the diameter and length of the crank-pin of an engine 16″×30″, running at 85 revolutions? *A.*—With steam pressure from 80 to 90 pounds, full pressure admitted to cylinder, we should make the pin 4½ inches in diameter and 5 inches long.

(426) J. J. L., New York City, asks: Will you tell me how to get a patent on an invention of mine? I have no pecuniary means. *A.*—Bring your invention to the attention of an honorable man who is interested in matters to which it pertains, with the object of inducing him to furnish the necessary means.

(427) J. C. S., Thomaston, Conn., asks: Is there anything that can be mixed with India ink to keep it from smearing? When it is first rubbed off it is all right, but after standing a while it will smear the paper. *A.*—We know of nothing you can add to the ink that will improve it. Use good ink, rub it down fine and keep it covered tightly.

(428) A. K. L., Bloomington, Ill., asks: What would be the probable horse-power of an engine 16″×30″, making 85 revolutions, with boiler pressure from 90 to 100 pounds? *A.*—If the engine is properly proportioned the mean effective pressure may be estimated at 40 pounds, and calling the net area of the cylinder 198.5″, and the piston speed 425 feet, the indicated horse power will be

$$\frac{198.5\times40\times425}{33{,}000}=102.$$

Deduct, say, 12 H. P. for friction, and the engine will be 90 effective horse power.

(429) W. S. B., London, Ont., asks: Is there any advantage in having the steam ports near the end of the cylinder, that is, short, over having them long, that is, running from towards the center of the cylinder, lengthwise, to the ends? *A.*—Yes. It reduces the clearance. When the exhaust opens, not only steam contained in the cylinder proper, but that contained in the port is exhausted; hence it follows that the shorter the ports the less the waste. Long ports also make more surface for condensing steam, and result in waste in this way.

(430) H. J. B., Quebec, Canada, asks: 1. Is it possible for wood to be ignited by coming in contact with steam pipes under a pressure of 85 pounds? *A.*—It is generally considered that wood cannot be ignited under the circumstances named, at the same time there is some reason for believing that fires have originated in this way. 2. How can I anneal cast steel? *A.*—Heat to a low red and bury in lime, or in ashes, to cool. 3. How can I temper small dies? *A.*—Harden in oil and draw to a dark yellow brown. 4. At what speed should circular saws be run? *A.*—Not to exceed 10,000 feet peripheral speed per minute.

(431) N. Y. C., New York, asks: 1. How may I know that the decimal .7854 is the right multiplier for finding the area of a circle? *A.*—Our advice is that you take this as others do, on the authority of mathematicians who have investigated the subject. We hardly think you will be able to prove or disprove the statement. 2. I have a pump with a 3″ suction, and my connection with the street main is only ¾″. Can I get water enough through the ¾″ connection to supply the pump? *A.*—You can probably run the pump slow enough to make it work in the way you indicate, but if you wish to work the pump to anywhere near its

capacity, you will not, unless the suction is several times larger than necessary, be able to get water enough to supply it.

(432) A. D., Shenandoah, Pa., writes: I have a slide valve engine 8″×12″, which I wish to run 250 revolutions per minute. The steam pressure on boiler is 60 lbs. 1. What horse power will I get? *A.*—If the engine is well proportioned, you should be able to get 20 horse power. 2. What size cylinder boiler will I require? *A.*—If you mean a cylindrical tubular boiler; 38″ in diameter and 13 feet long. 3. What would be the proper size of chimney for such a boiler? *A.*—Make the area of chimney not less than 1-7 the area of the grate surface of the boiler. 4. I have a pulley 4 feet in diameter from which I wish to belt, vertically, to an 18″ pulley using a quarter turn belt. What is the least distance apart of centers of shafts to insure good results with an 8″ belt? *A.*—We should say not less than 12 feet; preferably 15 feet.

(433) J. M., Winona, Minnesota, asks: What will be the force of the blow of a steam hammer with 6″ piston; weight of piston and ram 600 lbs.; drop 17″; steam pressure 80 lbs? *A.*—Nystrom's formula for this is:

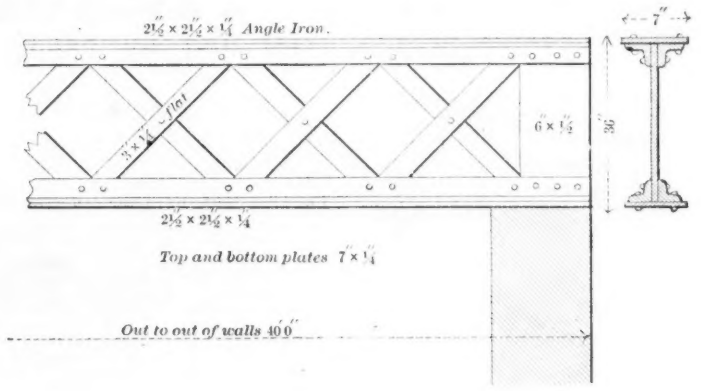
$$F=\frac{(W+P)\ (S+s.)}{s.}$$

In this formula F=force in pounds; W=weight of ram and piston in pounds; P=*total* pressure on the piston; S=stroke in feet; s=depth of penetration of blows in feet. The steam pressure may be taken as, say, 70 pounds, which would make the total pressure on the piston 1978 lbs.; in absence of any knowledge the penetration will be taken as 0.01 of a foot. Expressed in feet the drop is 1.416 of a foot; substituting these values in the equation:

$$F=\frac{(600+1.978)\ (1.416+0,01,=367,622}{0.01}$$

pounds.

(434) H. C. S., Fort Wayne, Ind., asks: Can you give me a rule for calculating the strength of a "Lattice Girder" to support a load in the center when the ends rest on a wall? The girder to be 36″ high × 40 ft. long, composed of angle irons 2½″x 2½″x ¼″, plates 7″x¼″, end pieces 6″x⅛″ the slats or lath, 3″x¼″, riveted with ½″ rivets. Enclosed sketch will show the style? *A.*—If a girder is supported at each end and one load applied in the center, find stress in chords by multiplying length of girder in feet by load in pounds and divide the product by four times the net section of one chord in square inches, times the depth of girder between centers of gravity of chords in feet. In the case given $\frac{40 \times \text{load}}{4 \times 3.4 \times 2.92}$ =stress in iron per square inch. One half the weight of girder must be included in the load which, in this instance, is 735 pounds (1470 total weight), and the stress per square inch should not exceed 10,000 pounds, in which case the load which the girder can carry in addition to its own weight will figure 9,300 pounds. The slats or lath have to carry one-half of the whole load (9,300 + 1,470), or 5,385 pounds to each abutment, and as the inclination of the slats is 45°, the strain in slats is 1.42×5.385=7,636 pounds, and as the two slats collectively have 2½″x½=1.25 square inches area of section, the strain in slats per square inch $=\frac{7,636}{1.25}=6,100$ pounds per square inch. The strain on rivets is 7,636 pounds divided by four times the section of a ½″ rivet or $\frac{7,636}{0.8}=9,540$ lbs. The two chords should be united by a vertical bar or slat of, say, 3″x¼″ section placed directly under the applied load at the center. In the sketch shown the slats are too light for the chord, and should be not less than 3/8″, and the rivets should be 5/8″ in diameter. If loads are uniformly distributed over the length of the entire span this girder would carry double the load, providing that the lath is made 7-16″ thick and the rivets are ¾″ in diameter.



(435) L. L. E., Trinidad, Col., and several others ask questions with reference to the position of the weight on the lever of a common lever safety valve, to hold different pressures of steam in a boiler. None of those who ask these questions gives all the data necessary to make the calculations, the most common omission being the center of gravity of the lever. This is an important omission, as without knowing this no calculation can be made, and leaving this out of the calculation may be a serious mistake, and one that will result in an accident. For working out this problem, we refer our correspondents to an article on this subject written by W. Barnet Le Van in the AMERICAN MACHINIST of June 26, 1880.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

C. M. Morse, Mech. Engineer, 132 Nassau St., N.Y.

F. Samuelson, Pattern Maker, 38 Gold St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

Latest and best books on Steam Engineering Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

J M. Badger, Expert and Commission Dealer in Machinery, 5 Dey Street, New York.

Hoerle Bros., Naugatuck, Conn. Small Dies and Special Tools to order.

J. C. Hoadley, Engineer and Expert, 29 High St., cor. Federal, Boston, Mass.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York.

Howard S. Abbot, Solicitor of Patents, 617 7th St., opposite the Patent Office, Washington, D.C.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

The American Standard of Bolts and Nuts. Price $1.00. Address, E. Lyman, C.E., New Haven, Conn.

Pattern Maker's Assistant. By Joshua Rose. 324 pages, $2.50 by mail, postpaid. Address orders, P. O. box 3,306, New York City.

A lot of 25″ lathes designed to equal the best Philadelphia tools, will soon be ready for delivery. Ohl & Co., E. Newark, N. J

Engine Lathes, Speed Lathes, Foot Lathes, Upright Drills, Light Drilling Machines and other fine tools, Frasse & Co., 62 Chatham St., N. Y.

Jas. F. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users and engineers. [Mention this paper.]

L. V. Conover, Iron Founder, 326 to 340 East 29th Street, New York. Heavy and Fine Castings of Iron, Brass, Composition and Copper made to order at shortest notice.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

Wanted to arrange with the right parties for the manufacture on royalty or otherwise, of a first-class automatic cut-off engine. Address, Box 10, care AMERICAN MACHINIST, 96 Fulton street, New York.

Six first-class screw cutting engine lathes with compound rest and power cross feed; equal to best Philadelphia tool in design and finish; ready for immediate delivery. Address Jos. B. Reed, Cairo, Ill.

The Theoretical and Practical Boiler Maker, 335 pages, and 37 lithograph plates. Published by the author, S. Nicholls, Yorkshire street, Blackpool, England Mailed on receipt of P.O.O value $1.83, to Blackpool. See Review, AMERICAN MACHINIST, p. 8, July 22, 1882.

Boiler Shop Tools.—Patent Bending Bolts, Boiler Plate Planers, Combined Punch and Shears. Single Punches or Shears of short or very long reach, Horizontal Flange Punches, Double or Single Bar Iron Shears, Radial Drills. Send to Hilles & Jones, Wilmington, Delaware.

"Extracts from Chordal's Letters," the most interesting mechanical book published. A great variety of mechanical and business topics treated in a way that will be instructive to old and young mechanics, and interesting to every body. Over 40 humorous illustrations; 320 pages, 12mo. Price, $1.50 per copy, by mail, to any address. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton Street, New York.

Bound Volumes and Patent Binders. We can furnish Volume 3 of the AMERICAN MACHINIST, containing the full 52 issues of 1880, or Volume 4, containing the 53 issues of 1881, neatly bound in cloth, ready to ship by express, for four dollars. Either volume unbound, three dollars. "Patent Binder" for the AMERICAN MACHINIST holds 53 weekly issues in good shape. Sent to any address by mail for one dollar. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton street, New York.

The *Sanitary Engineer* of Oct. 19, publishes with illustrations the report of Chief Engineer Durand Claye, of Paris, on the just completed Sewerage System of Berlin. It presents in each issue a great amount of matter of special interest to engineers, contractors, steam fitters and plumbers. If any reader of the AMERICAN MACHINIST who may now be buying the *Sanitary Engineer* of news dealers, will request it, the publisher will send him two weekly issues free if this advertisement is referred to. Address the *Sanitary Engineer*, 140 William street, New York. (P. O. box, 3037.)

MANUFACTURES.

Preparations are being made to build a large rubber factory at Hyde Park, Mass.

The Litchfield (Ill.) Car and Machine Co. are building an addition to their machine shops 80x60 feet.

The American Iron Works, at Pittsburgh, Pa., are building an addition 240x70 feet and 22 feet high.

W. C. Young & Co., Worcester, Mass., sold over 50 sets of their new lathe tools during October, in all over 500 tools.

The Brownell & Wight Car Co., St. Louis, Mo., are building a 30x140 feet addition to their shops. It will be three stories high.

The Vulcan Brass Foundry is a new establishment being erected at Newcastle, Pa., Mann, Plant & Co. are proprietors.

The Hartford Engineering Company are engaged on an order which includes fifty engines, aggregating 1200 horse power, for export.

The Bryden Forged Horse Shoe Works are erecting new shops at Catasaqua, Pa. Joshua Hunt of the Crane Iron Co. is president.

Hooker & Colville, steam pump manufacturers, St. Louis. Mo., are perfecting plans to erect a new shop 150×120 feet, three stories high.

The Bourne Manufacturing Company of Fall River, Mass., is erecting a two-story brick building, 190x40 feet, for a machine shop and cloth room.

Wood, Jennison & Co., Worcester, Mass., are manufacturing an improved shafting lathe, which has been thoroughly tested in their own shops.

The capital stock ($200,000) of the New York Locomotive Works, Rome, N. Y., has been fully paid up. The works have been in operation for several weeks.

William Perry of Brockton, Mass., has commenced the erection of an iron foundry to be ready January 18. It will be 50x130 feet, with an L 30x48 feet.

L. D. Cline, Alliance, O., is building a shaping machine which is well liked by machinists who have used one. He also builds a 5×6 engine for all purposes of small power.

The Racine Wagon and Carriage Co., of Racine, Wis., are building a three-story brick addition to their works, 26x70 feet, designed for boiler rooms below and workshop above.

The Lewis Foundry and Machine Company, limited, Pittsburgh, Pa., have begun the erection of an addition to their foundry. The new structure will be 95x20 feet, two stories.

W. H. Craig & Co., Lawrence, Mass., write us: We have just shipped some of our governors to Street, England, to be used there in paper mills, the purchaser having seen them in use in this country.

Stove manufacturing companies in this city are tolerably well supplied with orders and are running their works regularly. Trade, however, is not so active as it was a few weeks ago.—*St. Louis Age of Steel.*

Twenty-five acres of land, situated between the car factory and the fair grounds, at Dallas, Texas, has been donated to the Gulf, Colorado and Santa Fe Railroad, on which to erect passenger, freight and transfer depots and machine shops.

Simon Greene, Mansfield, Mass., has given land for a new manufacturing establishment. A stock company is to be formed and a building worth $10,000 erected on the land, to be leased to a company and used in the manufacture of machinery.

Wm. M. Lyon & Co., owners of thousands of acres in and around Tyrone, Pa., publicly announce that they will deed to individuals or companies, without cost, desirable sites for any kind of important manufactories —*Tyrone Herald.*

The Missouri Car and Foundry Company, St. Louis, lately burned out, are building an iron machine shop 130 feet in length by 50 feet in breadth, a woodworking shop 75 feet in width by 200 feet in length, a boiler house, an engine house, etc.

The Pratt & Whitney Co., Hartford, Conn., write us: "Notwithstanding the large production for the year, we now have in stock but a little more machinery than we had at the beginning of the year. We are now preparing our 1883 catalogue."

W. H. Harris, Buffalo, proprietor of the Harris Iron Works, has a new building 80x66, four and one-half stories, and new foundry 90x60, which are being fitted with machinery for the manufacture of the Harris hot-air furnace, and for general machine work.

Burlington, Vt, stands a fair chance of getting a large factory for making paper from wood pulp. The concern, with a $250,000 capital, proposes to put up buildings costing, with machinery, $150,000, and Burlington is asked to give $20,000 worth of help.

Among the establishments that have adopted Brown & Sharpe Manufacturing Co.'s style of shop closets, are Joseph Fahy's Watch-case factory, Sag Harbor, N. Y., which has about 50, and Edward Miller & Co., manufacturers of tin ware at Meriden, Conn., where there are 18.

Bradley & Co., Syracuse, N. Y., write us: We shipped one of our 200 lbs. cushioned hammers to Mexico last week; also a 100 lbs. hammer to Canada. Our sales keep up to the average, or about 15 to 20 hammers per month. We are having quite a large sale on our heating forges: some 15 to 20 per month.

The Ætna Iron Works, Clark, Raffen, & Co., Chicago, Ill., are adding to their works a new machine shop, 50x75 feet, four stories in height and of brick, which will be completed about January 1, 1883. They are also putting in a new engine and boiler of 80-H. P., and several thousand dollars' worth of machinery.

The E. Horton & Son Co., Windsor Locks, Conn., are about bringing out a two-jawed chuck, especially for the use of brass workers. This chuck will be made either universal or independent, as wanted. This company are well supplied with orders for their standard chucks, and indications point to a further enlargement of the works.

The Knowles Steam Pump Co., sales rooms 86 Liberty street, New York, are building a large addition to their factory at Warren, Mass. They are now busy on a number of compound condensing pumping engines for water works to supply the following cities: New Brighton, Staten Island, Freeport, Ill., Council Bluffs, Iowa, Fremont, O., and Denver, Col.

Wells Brothers, Greenfield, Mass., manufacture machine tools and quite a variety of small tools for machine shops. Their capacity for production has about doubled within the last year, yet complain that they can no more than keep up with their orders. They expect the year 1883 to give an increase over the present year.

The tall chimney mania in Lowell threatens to become epidemic. The Boott, Tremont and Suffolk, Merrimack, and Lowell Machine Shops have all either built new or topped out their old chimneys, and now the Appleton mills and Carpet mills have their chimneys surrounded by staging and are going still higher.—*Boston Commercial Bulletin.*

Pratt & Candee, Hartford, Conn., are making a lathe and planer tool which stands heavier cuts and feeds faster than ordinary tools. It can be used on a lathe or planer without altering the form. The area to be ground is much smaller than on ordinary tools. They have sold 800 sets of these tools since September 1st, of this year. It gives great satisfaction in the best machine shops.

The Hartford Engineering Co. has published a very neat descriptive catalogue and price list of the Medart Patent Wrought Iron Rim Pulleys in which they say: "It is an evidence of the popularity of this pulley, and a mark of the high favor in which it is held, that we are now putting in new machinery and otherwise enlarging our capacity to treble that of the past year." Last year they made 10,000 of these pulleys of all sizes from 12″ diameter by 3″ face to 108″ diameter by 31″ face.

A. M. White & Son, Waterbury, Conn., started two years ago to make special machinery in a room 18×20 feet, hiring their power. They now occupy two floors, each 35×45 feet, and have their own power. So rapidly has their business increased that they are crowded for room, and about the 1st of January will put in an engine double the power of the one now in use. Their orders now booked will carry them three months into 1883. Among their new specialties about to be introduced are a new ratchet drill and a new bench drill.

Dwight Slate, Hartford, Conn., employs 26 men making wood screw machinery, sensitive drills, Combination grinding machines for reamers, cutters, &c., marking machines, cutting-off tools for lathe work, lathe center grinders and screw slotting machines. He also designs and builds automatic machines for special purposes. He has just completed a lot of 30 drills, which makes a total of 300 in four years. There is an increasing demand for Slate's cutting-off tools and they are now supplied with nearly all the cutting-off lathes made. He is about to bring out a new style of milling machine.

The Mount Savage Locomotive Works are situated at Mount Savage, Alleghany county, Md., and are owned and controlled by the Cumberland & Pennsylvania Railroad Company. They were originally built and used for the construction and repair of the engines used by the company; but for more than a year past they have been actively engaged in building locomotives, both of standard and narrow gauge, for the general market. Recent improvements, and the addition of a large quantity of new machinery, have greatly increased their facilities for doing this class of work, and they are now prepared to take contracts for deliveries in 1883, more especially for locomotives of the mogul or consolidation pattern.—*Railway Review.*

The Robinson Boiler Works, East Boston, Mass. are very busy with work. Among their orders are ten tubular boilers for the Grinnell Mill, New Bedford, Mass.; three for Tobias New, John street, New York; five for the Avery Lactate Co., Littleton, Mass.; two for the Arnoux Electric Light Co., Portland, Me., and two for the Washington Mills, Lawrence, Mass. These boilers will all be set with the Jarvis furnace and use the Sheffield grate bars to burn fine coal for fuel. Among other boilers being set with this furnace we note three for the American Truck Co.; one for A. Cochran & Co.'s chemical works; one for the Turner & Delany Engine Co., of Richmond, Va.; one for the Union Elevator Co, Peoria, Ill., and several others in different parts of the country.

Machinists' and Engineers' Supplies.

NEW YORK, Nov. 16, 1882.

Although the general condition of the supply market remains quiet, yet the volume of business is fair considering the close proximity of the holidays. The manufacturers are as a rule busy on incompleted back orders.

James Beggs & Co., 9 Dey street, New York, has a stock of a new style of chain pipe tongs. They have several new features, the principal one being reversible plates having additional teeth for gripping the pipe. When worn out these plates can be replaced with new ones.

D. Saunders' Sons, Yonkers, N. Y., are putting on the market a new hand-wheel pipe cutter, for which many points of advantage are claimed. It is adapted to various sizes of pipe, and has a rolling instead of a sliding motion. All wearing surfaces are of tool steel, hardened.

A. M. White & Son, Waterbury, Conn., are about to bring out a small drill for the bench, also a new ratchet drill.

The Morse Twist Drill and Machine Co., New Bedford, Mass., have issued a special circular to dealers in which the prices of their chucks, reamers and milling cutters have been advanced five per cent., while those of twist drills and sockets have been reduced ten per cent.

Iron and Metal Review.

Business in Pig Iron continues very quiet and the evidences of an over production are beginning to appear.

We quote as follows: Foundry No. 1, $25 50 to $27. Foundry, No. 2, X, $23.50 to $25. Grey Forge, $21.50 to $21.50. The demand for Foreign iron continues moderate with no changes in prices worthy of note. The supply is light, most of which is sold previous to arrival. We quote Coltness at $27 50; Glengarnock, $25; Gartsherrie, $26 to $26.50; Summerlee, $26 50; Carnbroe, $24.50; Eglinton, $23.50 to $24; Langloan, $26 to $26.50.

Copper continues quiet at 18c to 18¼c. Banca Tin 28c.; Straits and Malacca 23¾c. to 23c; Billiton 23c.; Australian 23¾c to 23¾c.; Spelter, Common Domestic, 5c. to 5¼c; Refined, 8c to 8¾c.; Silesian 5c. to 5¼c.; Lead, 4.80c. to 4.85c; Refined, 4.90c.; Antimony, Hallet's, 10¾c. to 10¾c; Cookson's, 12¾c. to 12⅞c.; Nevada 12⅛c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words one line) each insertion Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Wanted—A permanent traveler to represent the Gardner Governor. Must be well posted. Address, R. W. Gardner, Quincy, Ill.

Mechanical draughtsman and superintendent with good practical experience, wants employment. X., care AMERICAN MACHINIST.

Wanted—Foreman for machine shop—about 25 hands manufacturing engines and mill machinery. A thoroughly competent, pushing, practical man. Address, 6 Strachan Avenue. Toronto, Canada.

Steam Users in want of First-Class Licensed Engineers can be supplied with reliable men. Address, Benj F. Kelly, No. 20 Cortlandt St., New York. Agent for James Jenks' Duplex Injector and The Baragwanath Steam Jacket Feed Water Heater and Purifier.

First-class mechanical draughtsman and engineer; graduate of polytechnic, of long practical experience, able to design any kind of machinery and buildings for same, desires situation. Address H. Y., AMERICAN MACHINIST.

Wanted—An expert wood workman, to take charge of a shop, where a variety of first-class manufacturing in woodwork is done. Must be well informed, of unquestionable habits, and capable of directing men and instructing apprentices. A good position for the right man. Address T. S., care of AMERICAN MACHINIST, N. Y.

Mechanical Engineer and Draughtsman of over fifteen years' experience, thoroughly conversant with the minutiæ of all departments; competent to design, construct, manage or superintend, will want an engagement shortly. Specialties: Steam pumps and steam machinery. Either opportunity to advance or good salary required. Address, Practical, AMERICAN MACHINIST office.

Wanted—An active, energetic and competent practical machinist to take charge of a machine shop as foreman; class of work, the manufacture of wood-working machinery and general repairing. We want a thorough mechanic and one who understands taking charge of work and men. No others should apply. Must be active, industrious and sober. To such an one we offer good wages and prompt pay. References given and required. Address, Employer, No. 6 Franklin Avenue, Toledo, Ohio.

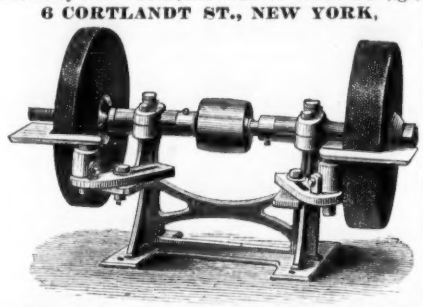
For sale—A Hittinger & Cook engine, 12x36, in good order. Apply at Hydraulic Works, VanBrunt street, South Brooklyn, New York.

Heavy Tools Wanted—First-class 30-foot pit lathe and 6 or 7 foot planer. Send lowest prices with full particulars, and name quickest delivery. M. C. Bullock, Manufacturing Co., 80 Market street, Chicago, Ill.

For Sale—1 Dead Stroke power hammer, manufactured by Philip S. Justice; has been used only a few months; in perfect condition; weight of ram 15 lbs. Cause for selling it, not heavy enough; price, $125. Address the Edward Harrison Mill Co., New Haven, Ct.

D. H. TUTTLE 21 BEEKMAN ST NEW YORK — Engraver on Wood — MECHANICAL WORK A SPECIALTY

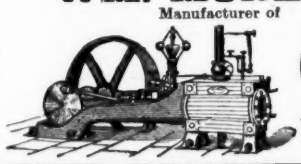
COOKE & CO.
Formerly Wm Cooke, successor to Cooke & Beggs)
6 CORTLANDT ST., NEW YORK,



Agent for the Lehigh Valley Emery Wheels & Emery Wheel Machinery.
Our wheels possess superior cutting qualities, combined with great durability. Eureka Plow Polisher and Patent Stove Plate Grinders.

JEROME B. SECOR,
MANUFACTURER OF
Machinery and Tools,
IMPROVED WIRE FEED SCREW MACHINES, GUN AND SEWING MACHINE TOOLS, DIES FOR DRAWING, FORGING, BLANKING, &c., MADE TO ORDER.
Manufacturer of
THE SECOR SEWING MACHINE,
Factory Cor. Broad & Railroad Ave.
BRIDGEPORT, CONN.

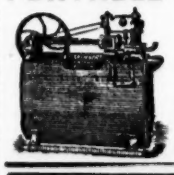
WM. MÜNZER,
Manufacturer of



IMPROVED CORLISS ENGINE.
1st Av. cor. 39th St. New York.

FOR SALE.
4 New Cylinder Boilers 36″ diam. x 30′ long each, with fittings and fixtures complete, including 1 Steam Drum 24″ diam. x 13′ long; 1 Mud Drum 20″ diam. x 16′ 6″ long.
ALSO,
3 New Stationary 2 Flue Boilers, 42″ diam. x 30′ long, Flues 14″ diam., with complete fixtures and fittings, including 1 Steam Drum 24″ diam. x 12′ long. Breeching, Stack, Etc.
Full Specifications, with drawings, will be furnished upon application.
Stearns' M'f'g Company,
ERIE, Penna.

PORTABLE and STATIONARY ENGINES And BOILERS,



5 to 25 H. P. Parts duplicate and interchangeable, specially adapted to run Electric Light Machinery. Send for Circular.
SKINNER & WOOD, Erie, Pa.

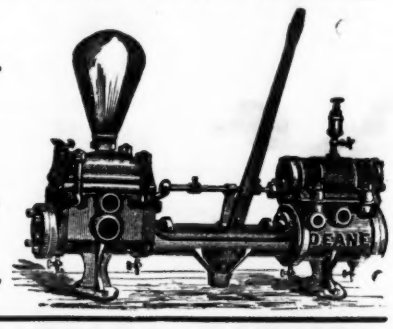
PECK'S PAT. DROP PRESS
BLAST FORGES.
STEEL & IRON DROP FORGINGS
Drop Dies and Special Machinery.
BEECHER & PECK, NEW HAVEN CONN.

Hand Paper Holder.
Adapted to hold one to four issues of the AMERICAN MACHINIST, for office or library use. A convenience that will be appreciated by many readers. Price by mail, prepaid, 75 cents.
American Machinist Publishing Co., 96 Fulton st., N. Y.

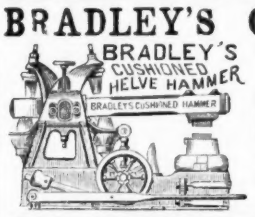
Patent Lathe Chucks Best & Cheapest

Hold from 1 in. to 20 ft. diam. In use 14 years, and good for 20, on roughest dirtiest work. Sent on trial by American Twist Drill Co., Meredith, N. H. Sole Manufacturers.

"THE DEANE" STEAM PUMPS FOR EVERY SERVICE.
Send for New Illustrated Catalogue.
The Deane Steam Pump Co.
HOLYOKE, MASS.
92 & 94 Liberty St., New York. 54 Oliver St. Boston. 226 & 228 Lake St., Chicago.

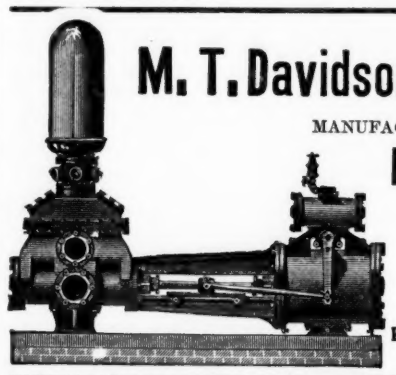


BRADLEY'S CUSHIONED HELVE HAMMER.



Awarded first premium, Silver Medal at American Institute Fair, 1873, Cincinnati Industrial Exposition, 1874, and the Diploma of Honor and Grand Medal of Merit at the Centennial Exhibition, in 1876.
Being the highest award given any goods of their class in America or Europe.
IT HAS MORE GOOD POINTS, LESS COMPLICATION,
MORE ADAPTABILITY, LARGER CAPACITY,
DOES MORE AND BETTER WORK. TAKES LESS POWER,
COSTS LESS FOR REPAIRS,
THAN ANY HAMMER IN THE WORLD.
Guaranteed as represented. (Established 1832.)
BRADLEY & COMPANY, Syracuse, N. Y.

THE
M. T. Davidson Improved Steam Pump,



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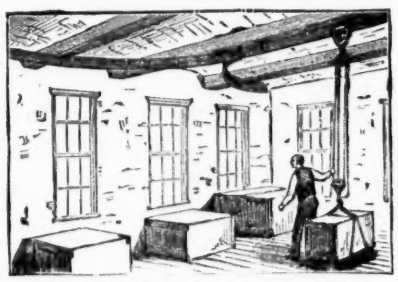

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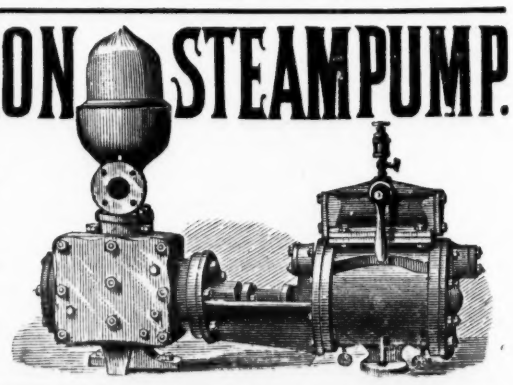

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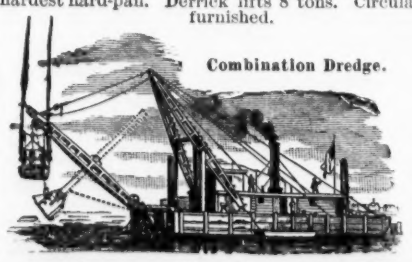

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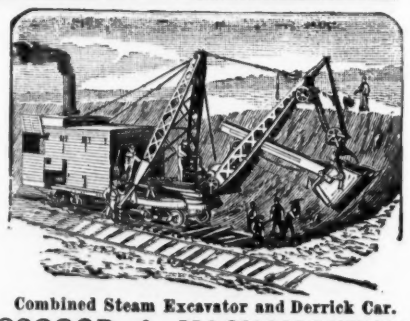

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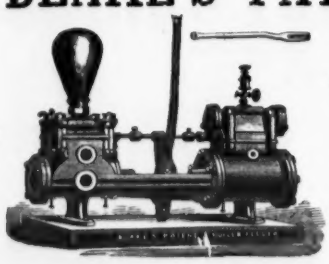

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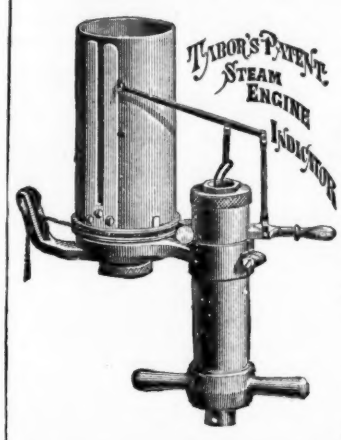

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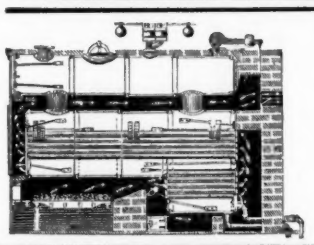

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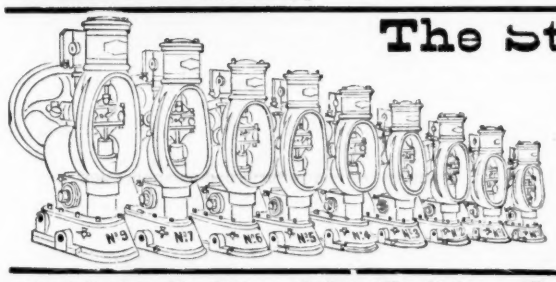

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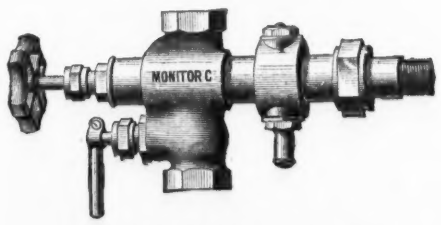

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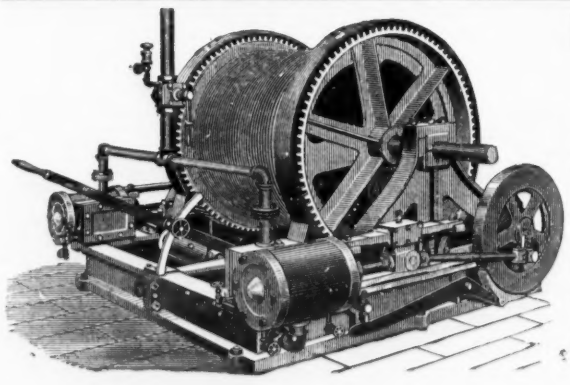

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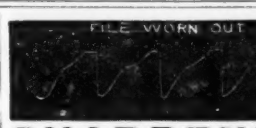

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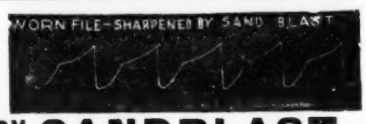

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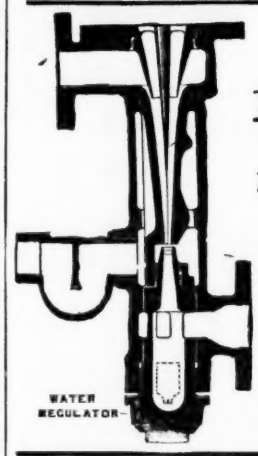

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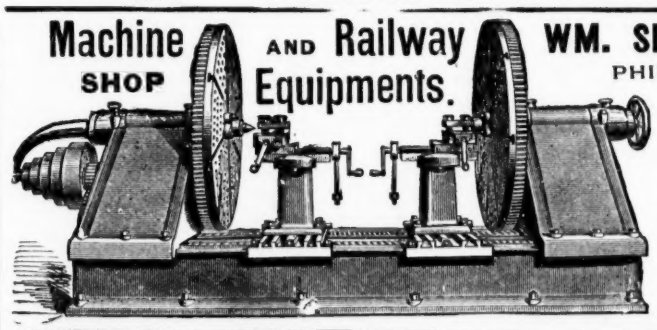

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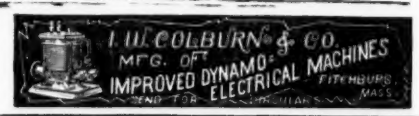

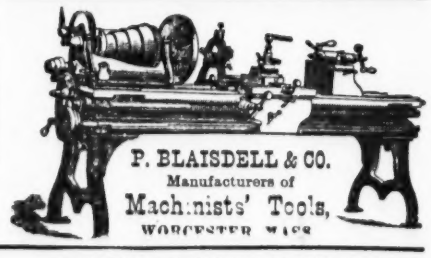

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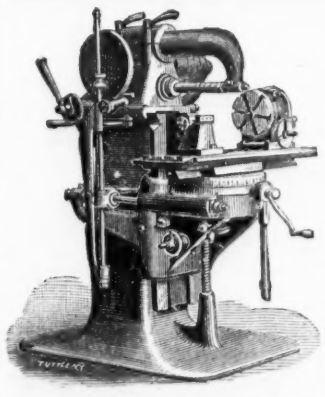

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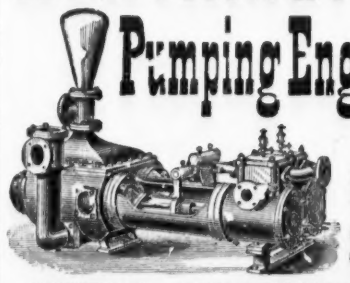

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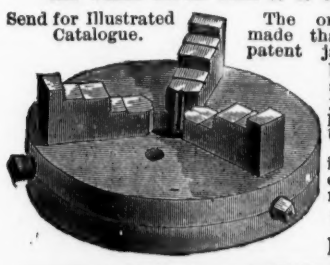

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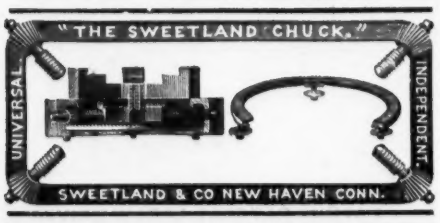

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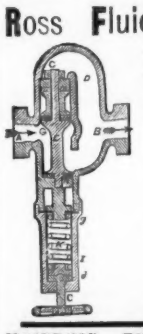

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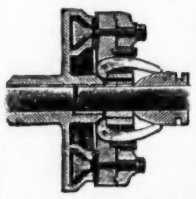

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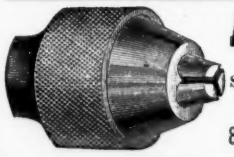

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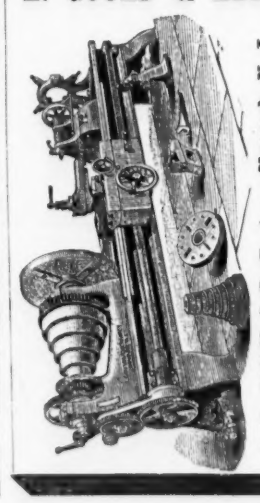

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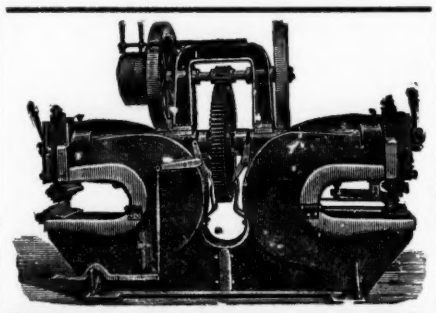

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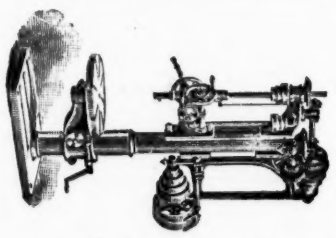

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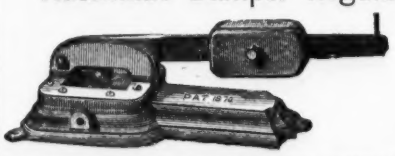

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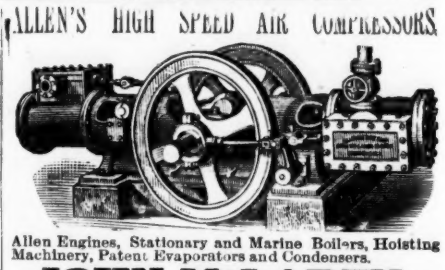

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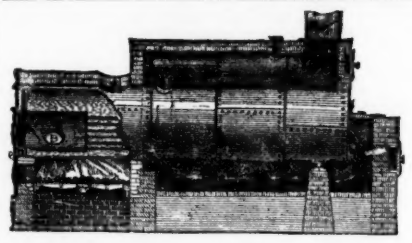

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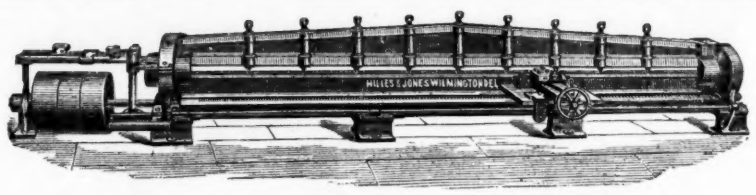

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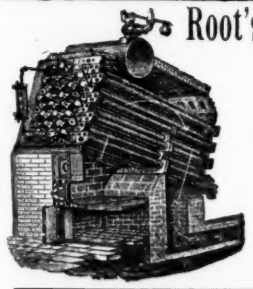

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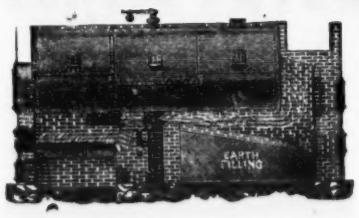

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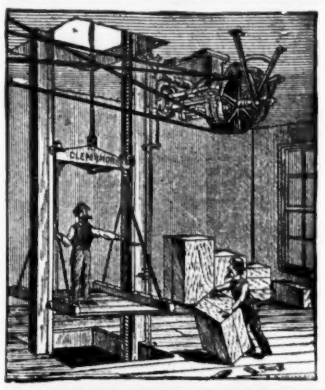

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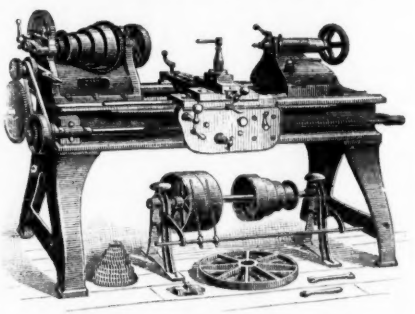

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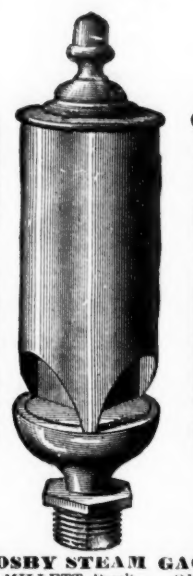

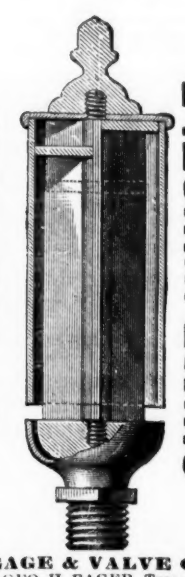

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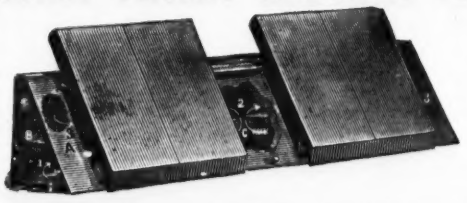

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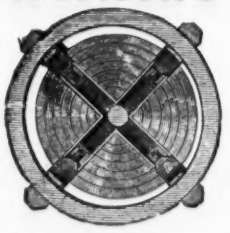

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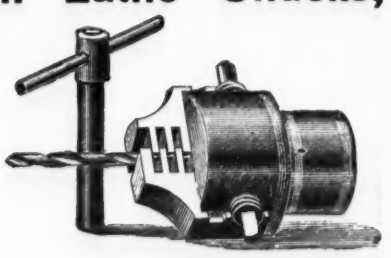

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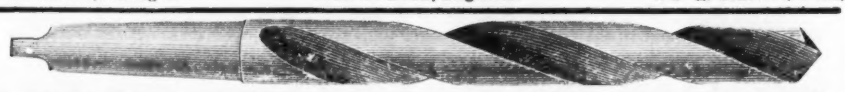

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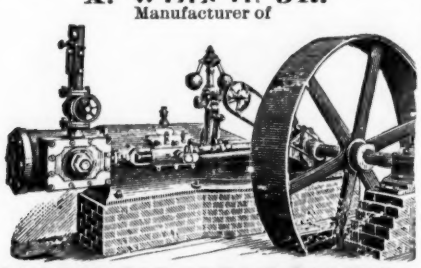

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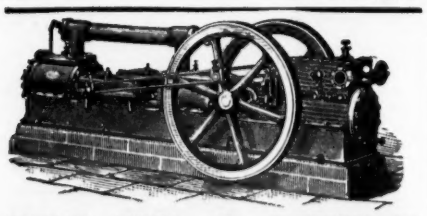

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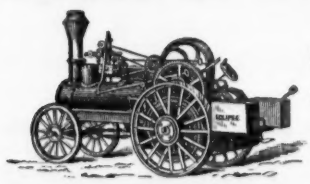

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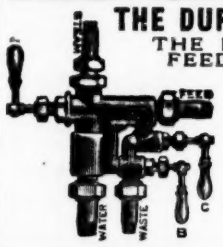

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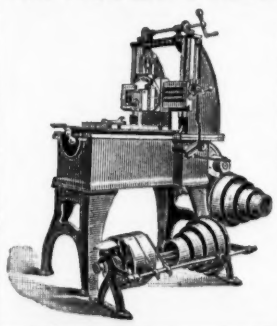

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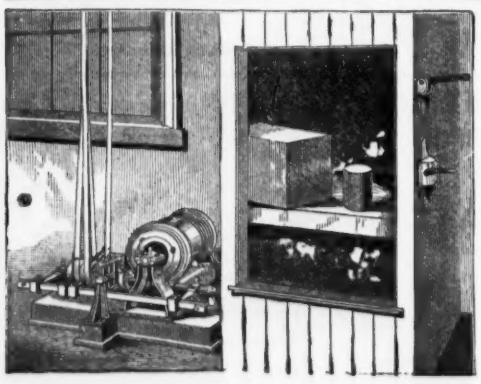

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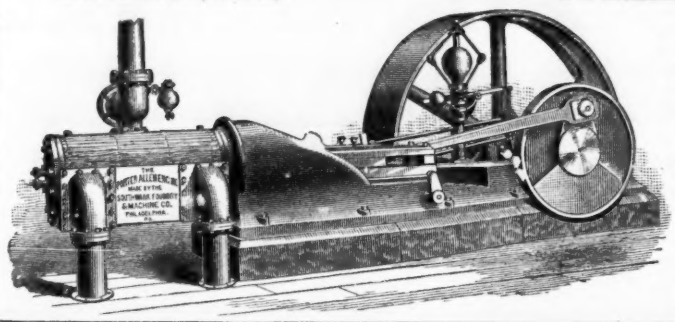

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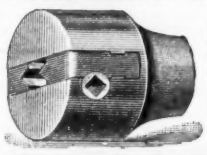

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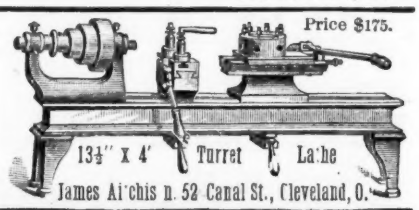

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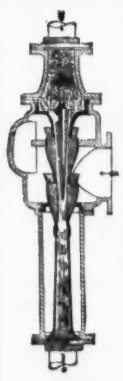

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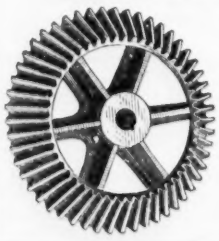

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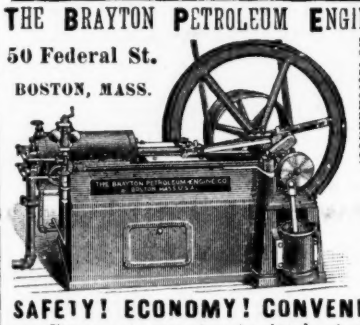

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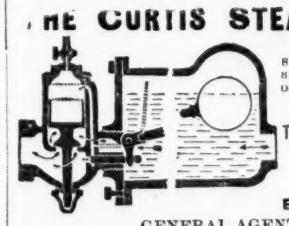

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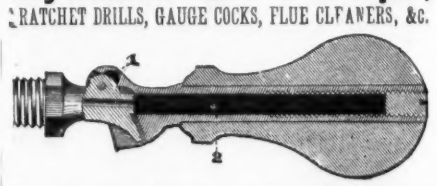

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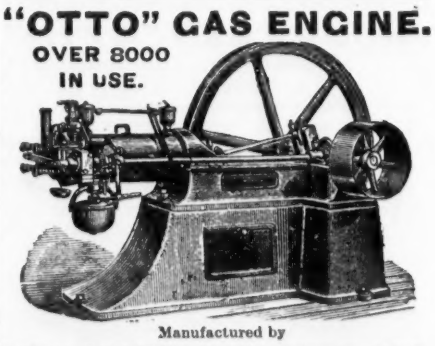

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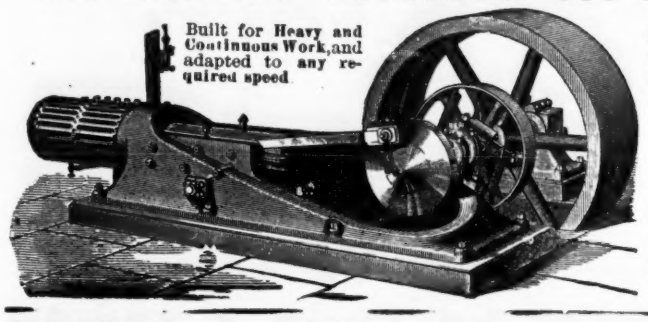

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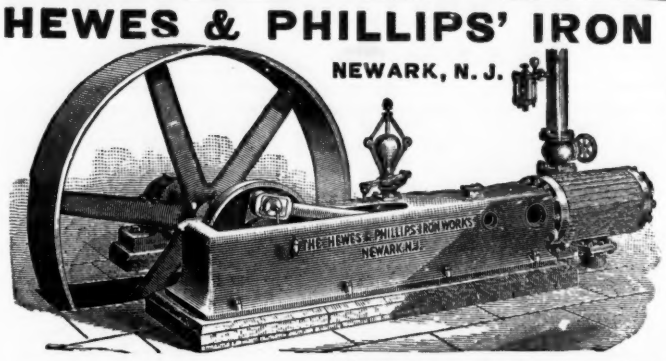

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10 inch stroke shaper,	Gould.
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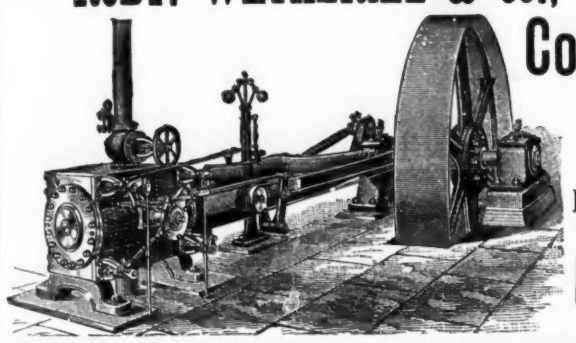

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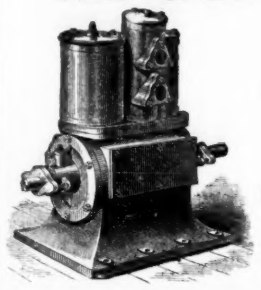

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1	" "	26 in. x 12 ft.	Grant & Bogert. [New
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1	" "	36 in. x 12, 17 ft.	New.
1	" "	42 in. x 14 ft.	New.
1	" "	82 in. x 8 ft	" "
1	" "	21 in. x 7 ft.	" " Pond.
1	" "	14 in. x 6 ft.	Star Tool Co. New.
1	" "	15 in. x 6 ft.	"
1	" "	14 in. x 5 x 6 ft.	"
1	" "	16 in. x 6, 7 & 8 ft.	Bridgeport. "
1	" "	13 in. x 5 ft & 6 ft.	Ames. "
1	" "	16 in. x6, 7 & 8 ft.	Ames. "
1	" "	18 in. x 8 & 10 ft.	Lodge & Barker"
1	" "	24 in. x 12 ft.	Perkins "
1	" "	20 in. x 12 ft.	Fifield New.
1	" "	28 in. x 16 ft.	New. Fifield.
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1	" 20 in. x 20 in. x 4 ft.		Good order.
1	" 16 in. Turn Table Drill.		New.
1	16 in. Upright Drill.		"
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1	24 in. " "		" "
1	30 in. " "		" "
1	25 in. swing B.G. & S.F. Drill.		Blaisdell. "
1	28 in. " "	" "	" "
1	15 in. Shaper.		Gould & Eberhardt. "
1	10 in Shaper.		Gould & Eberhardt. New.
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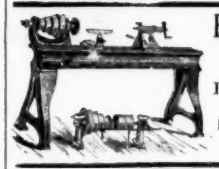

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90 inch Swing,	20 foot Bed,	Engine Lathe.		2d hand.
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36 "	18x12 "	"	"	"
34 "	9 "	"	"	"
30 "	18-6-4&12 ft. beds	"	"	"
24 "	14 foot Bed,	"	"	"
20 "	6&10 "	"	"	"
18 "	8 10&12 "	"	"	"
17 "	6 "	"	"	"
16 "	6&8 "	"	"	"

Large list of 2d-Hand Lathes, Various sizes & lengths.

38	inch x 38	inch x 12	foot	Iron	Planer.	New.		
38	" 38	" 8	"	"	"	"		
36	" 36	" 11	"	"	"	"		
36	" 36	" 9	"	"	"	"		
32	" 32	" 9	"	"	"	"		
27	" 27	" 7	"	"	"	"		

and other sizes.
Shapers, Drills, Boring Mills, Cutting-off Machines, &c.
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1	36 in. "	14 ft. "	" "	"	15.

The following on hand:

1 30 in. Swing, 18 ft. bed, New Engine Lathe.
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2 38 in. Swing Upright Drills. B. G. & S. F. New.
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1 22 in. " Upright Drill. B. G. S. F. New.
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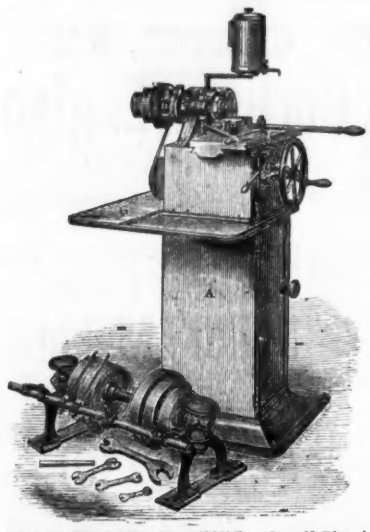

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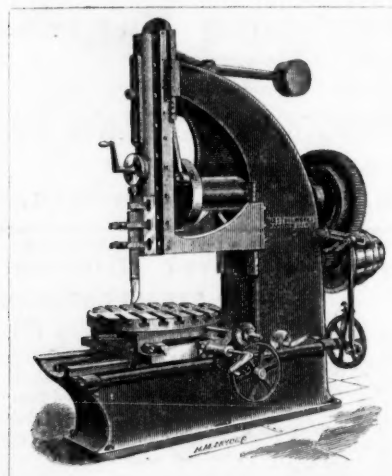
This machine is designed for ordinary milling operations upon small work. There is the usual automatic feed operating the table, and a hand-lever attachment, either of which can be made use of, as the charac er of the work to be done may require. The spindle of the machine is provided with anti-friction bearings and arrangement to close up as wear takes place. Attached to the stand and bed is the pan G, forming a convenient place for tools, work and waste. Overhead works accompany the machine.

Whole length of table, 20 inches; whole width of table, 7¾ inches; distance of feed of table, 9 inches; height of center above table, lowest point, 1½ inches; height of center above table, highest point, 8¾ inches; vise-jaws, 3½ inches long, ¾ inche deep. Weight, boxed ready for shipment, about 750 lbs. Price, boxed and delivered at Railroad or Steamer in Providence, $260.



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FROM 16 to 48 IN. SWING.

Cuts, Photographs and Prices furnished on application.

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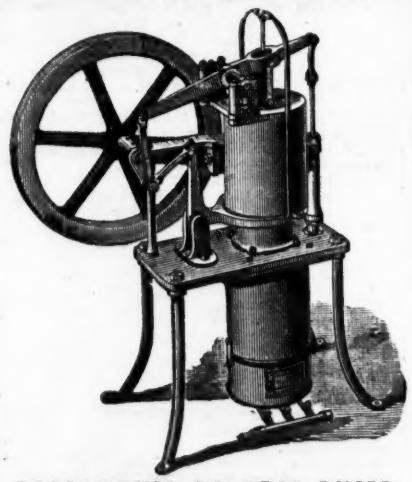

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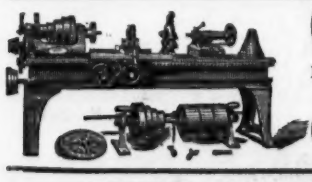

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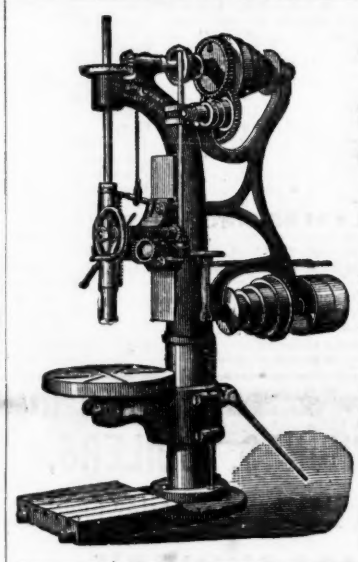

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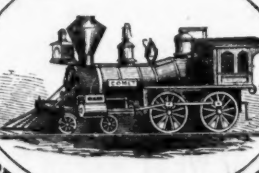

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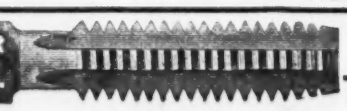

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